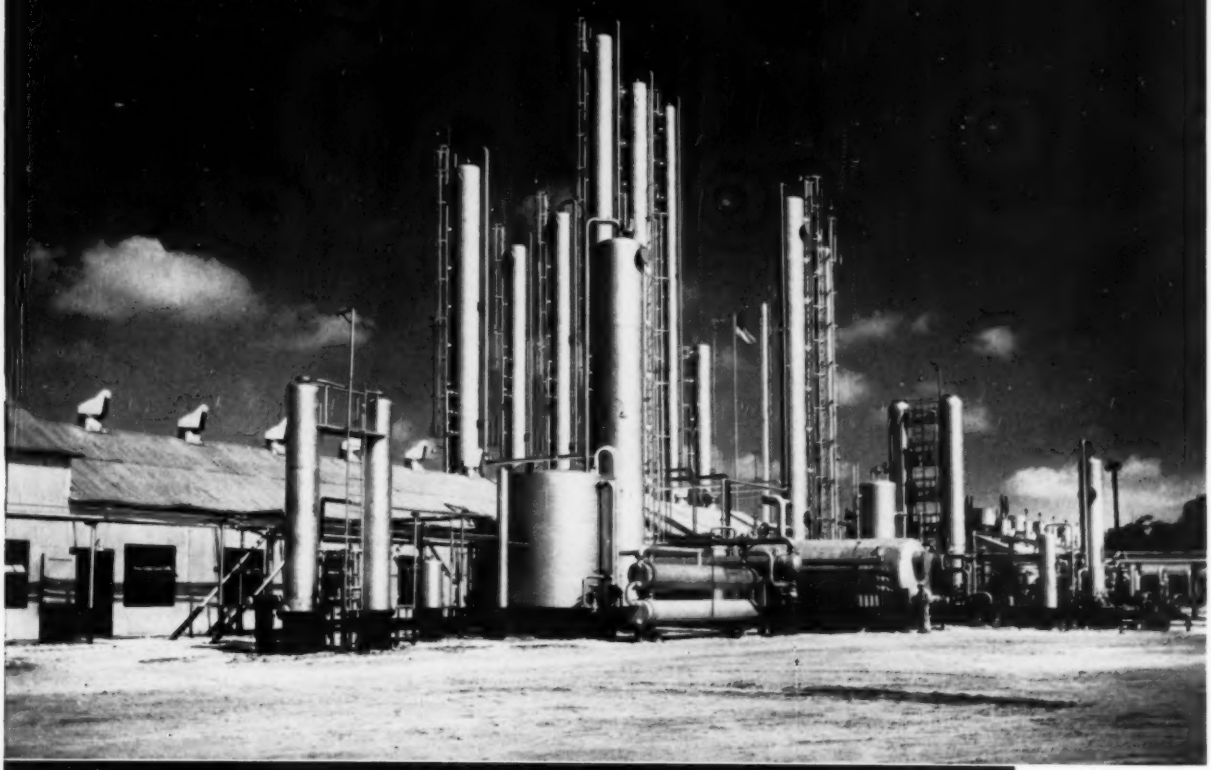
World Petroleum

JULY, 1949 FIVE DOLLARS PER YEAR FIFTY CENTS PER COPY

7 Reasons WHY IT'S WARREN

1. PERSONNEL
2. EXPERIENCE
3. FACILITIES
4. PRODUCTION
5. STORAGE
6. TRANSPORTATION
7. RESEARCH

From 4,900,000 gallons of Natural in 1922 to approximately 2,000,000,000 gallons of Natural Gasoline and Liquefied Petroleum Gas in 1948.



WARREN PETROLEUM CORPORATION

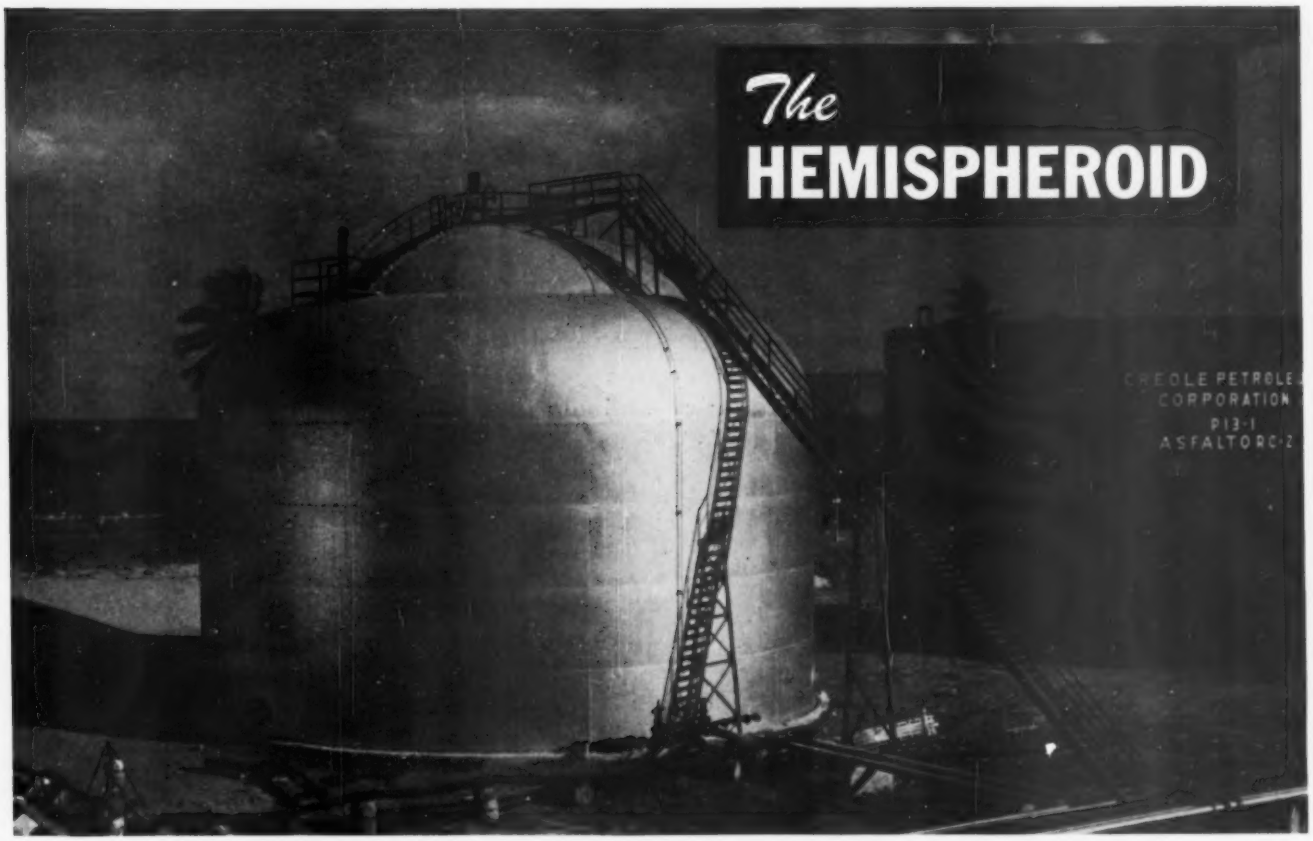
Producers, Manufacturers, Exporters and Marketers

Export Terminals: Corpus Christi, Port Arthur, Baytown, Texas City, and Norsworthy, Houston, Texas.

TULSA 2, OKLAHOMA CABLE ADDRESSES: Stavolene, Warren

WARREN'S CROSSVILLE, ILLINOIS PLANT

Crude Oil, Natural Gasoline and Liquefied Petroleum Products



...efficient pressure storage in an economical "package"

The Horton Hemispheroid combines the advantages of pressure storage with the economical construction cost of conventional storage tanks. When you are storing motor and natural gasolines, consider the benefits this combination may have for you.

The use of pressure storage results in two important benefits. First, uncertainty regarding evaporation losses is removed. No loss can take place while the internal pressure is below the pressure relief valve setting. And a glance at the relief vent will indicate if any loss is occurring.

Secondly, internal pressure is entirely independent of the volume of the vapor space in the tank. Therefore, for standing storage at a given working pressure, the Hemispheroid is just as efficient nearly empty as it is when almost full. Thus it is well adapted for use at bulk stations or marketing terminals where containers are filled and emptied only a few times per year.

Add to these the low erection cost of its construction and it is evident that the Hemispheroid means *efficient storage in an economical "package."*

Bulletin E lists available capacities of Hemispheroids and tells you how to select a proper working pressure. Write our nearest office for your copy.

Other Chicago Bridge & Iron Company products for storing petroleum hydrocarbons include:

- HORTON DOUBLE-DECK FLOATING ROOFS—For new or existing tanks filled and emptied frequently.
- HORTONSPHERES — For storing butanes, propanes and products of similar volatility.
- HORTONSPHEROIDS — For storing moderately volatile products.
- HORTON VAPORSPHERES—For use in connection with fixed-roof tanks storing crude oil or gasoline to prevent evaporation.
- HORTON VAPORDOME ROOF — To prevent standing storage evaporation losses from flat-bottom storage tanks.

Literature on the above Horton products is available at our nearest branch office.

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IF YOU FIT

the world's best friction linings

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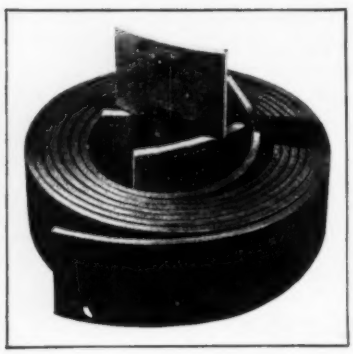

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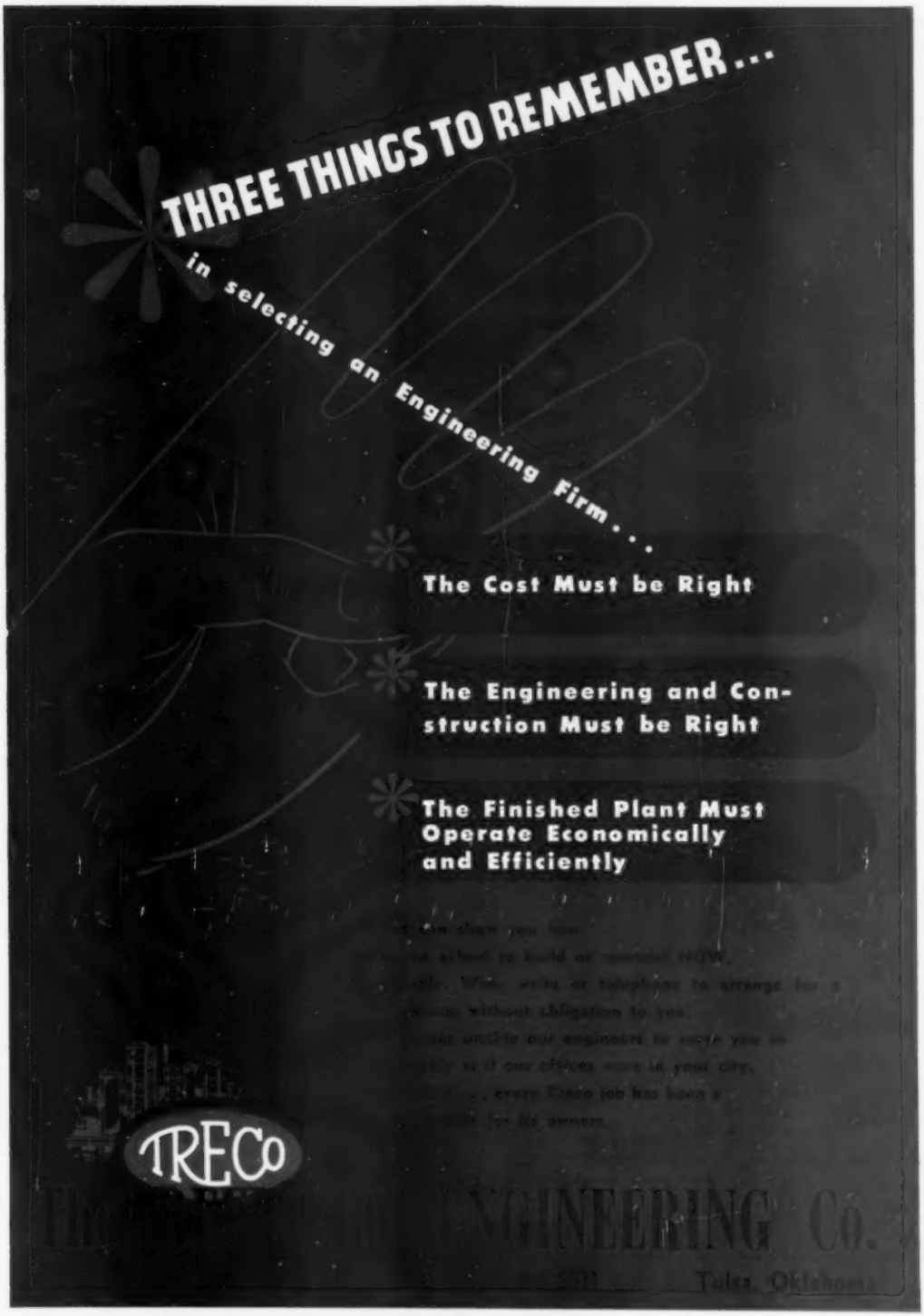
THREE THINGS TO REMEMBER...
in selecting an Engineering Firm...
The Cost Must be Right
The Engineering and Construction Must be Right
The Finished Plant Must Operate Economically and Efficiently
TRECo
ENGINEERING Co.
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WORLD PETROLEUM for July, 1949, Vol. 20, No. 7. July, 1949. WORLD PETROLEUM is published monthly by Mona Palmer, Trustee under the will of Russell Palmer, 2 W. 45th St., New York 19, N. Y. Acceptance under the Act of June 5, 1934, at East Stroudsburg, Pa., Authorized September 23, 1946. Subscription rate: $5.00 per year, single copies 50c.

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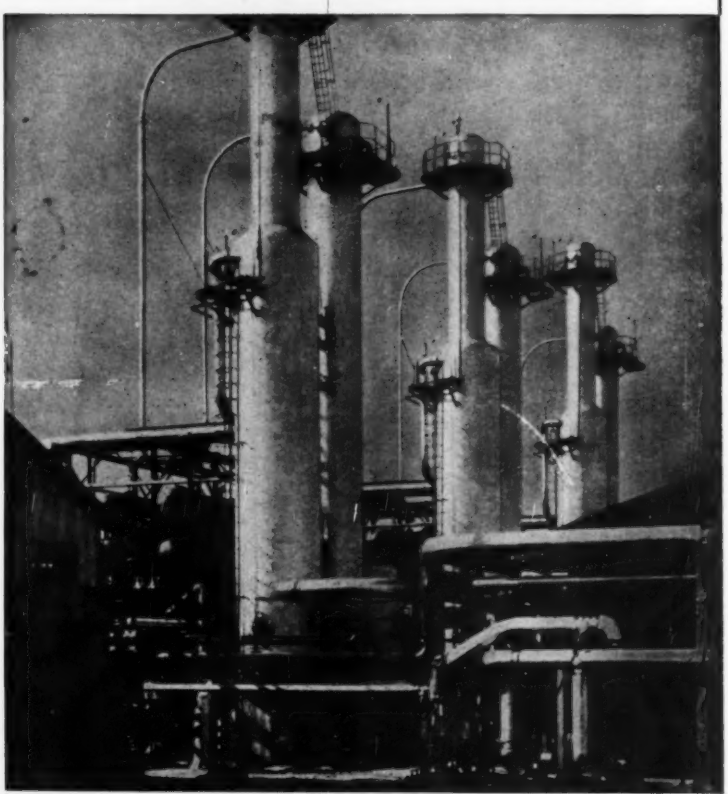
IS EXTENSIVELY USED ON THE CLASS OF WORK ILLUSTRATED. IT HAS AN EXTREMELY LOW THERMAL CONDUCTIVITY, IS LIGHT IN WEIGHT AND WILL MAINTAIN ITS EFFICIENCY THROUGHOUT THE LIFE OF THE PLANT. BEING EASY TO APPLY, ALSO INEXPENSIVE, IT IS IN ALL RESPECTS AN IDEAL COVERING FOR BOILERS, PIPES, HEAT EXCHANGERS, ETC. WRITE FOR OUR CATALOGUE "HEAT INSULATION" WHICH DESCRIBES ALL OUR HEAT INSULATING MATERIALS.



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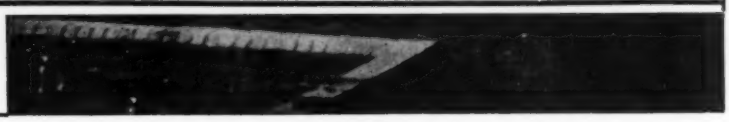

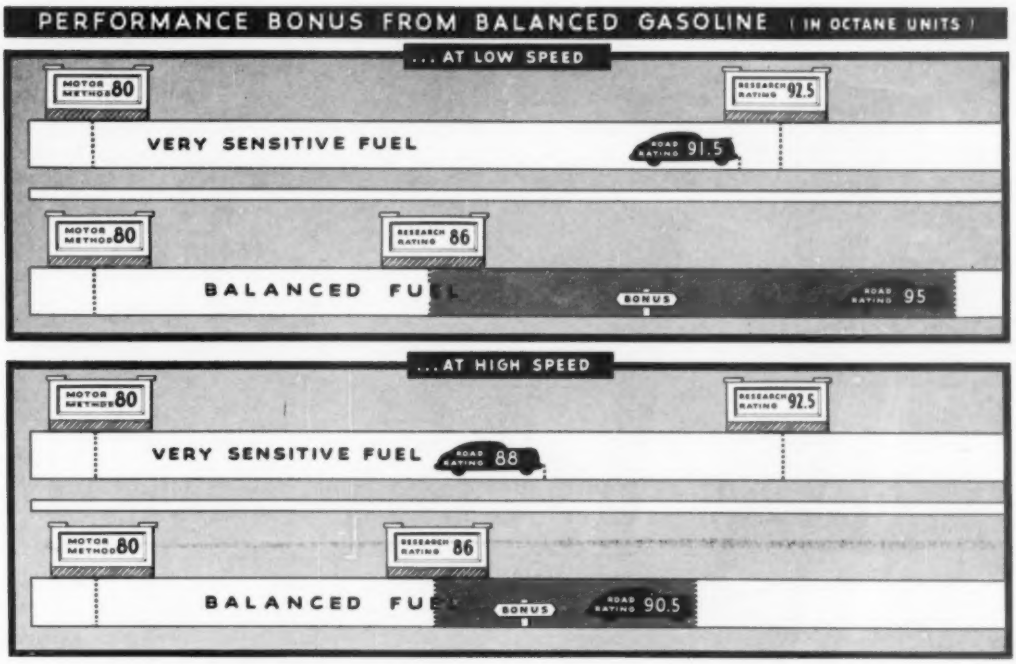

*Boosting road performance with balanced gasoline**

WHAT are the possibilities of balanced gasolines—and what do they mean to long-range refinery planning?

To help refiners find the answer, Ethyl Corporation utilizes its unique position between the automotive and petroleum industries.

Over the past ten years, Ethyl's work on fuels and engines has demonstrated that the hydrocarbon distribution throughout the boiling range of a gasoline is fundamental to its performance on the road. This hydrocarbon distribution may be revealed in part by the "jump," or sensitivity—Research method octane rating minus Motor method rating—but it is becoming increasingly clear that these conventional laboratory ratings may not indicate the quality of fuels in actual service.

The chart illustrates the performance possibilities to be realized through balancing a gasoline. These two non-leaded fuels—a very sensitive gasoline and a balanced gasoline—have equal Motor method ratings of about 80. The very sensitive gasoline has a Research rating of 92.5, giving it a sensitivity of 12.5. The balanced gasoline rates only 86 by the Research method, giving it a sensitivity of just 6 octane numbers—less than half that of the very sensitive fuel.

Yet when these fuels are rated on the road, the balanced blend is far ahead. It rates some 9 octane numbers above its Research value at low speeds, and continues to rate above its Research octane number even at high speeds. The very sensitive gasoline, on the other hand, rates just slightly under its Research value at low speeds and substantially under at high speeds.

These characteristics are particularly important inasmuch as development programs indicate that vehicles of the future will have high speed octane requirements considerably above those of present-day automobiles. Highly sensitive fuels often tend to drop off rapidly in antiknock quality on the road as engine speed increases.

It is not Ethyl's objective to advise oil companies on refinery operation. This particular research program is intended only to indicate the unusual possibilities of balanced gasoline, and to suggest broadly how refiners may achieve similar results.

**A balanced gasoline has a distribution of hydrocarbon types with respect to boiling range so controlled that it will give optimum road antiknock quality and optimum road tetraethyllead susceptibility at all engine speeds.*

Since 1923—*continuous research to provide better antiknock service*

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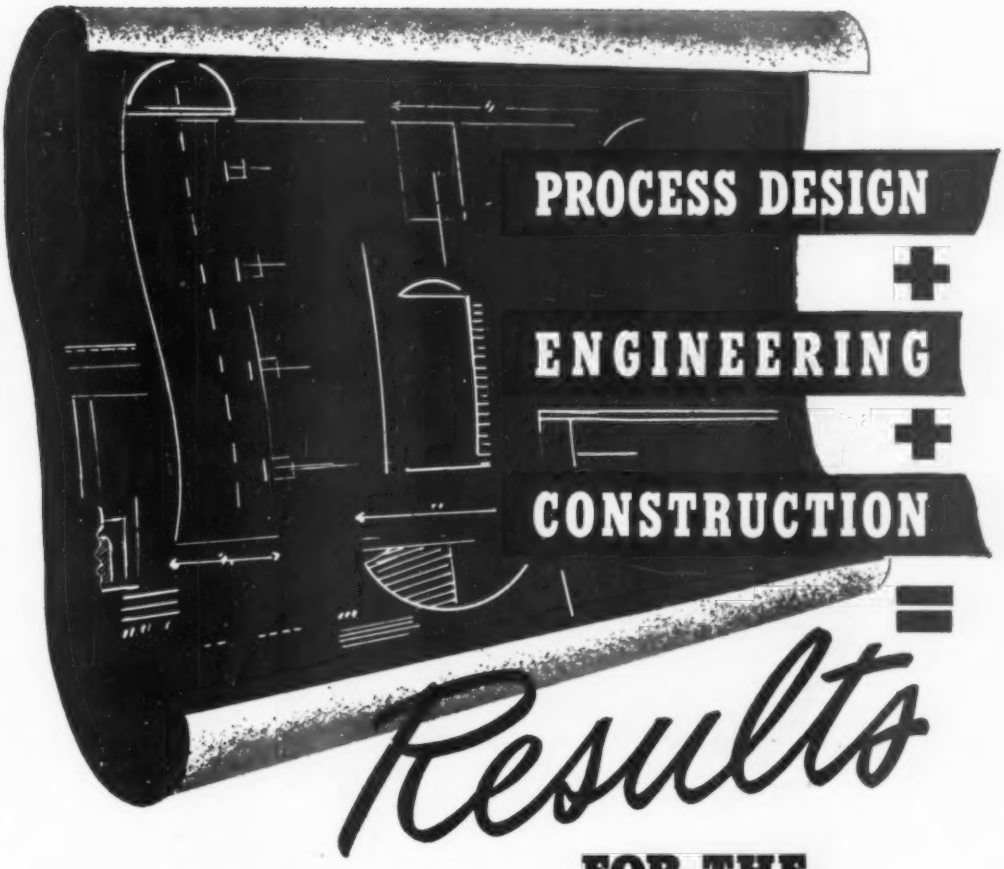

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What price liberty?

IT was Daniel Webster who said, "God grants liberty only to those who love it and are always ready to guard and defend it."

Today in our yearning for "security", we are inclined to forget about that "liberty" for which this old bell rang out. The two are not synonymous. When we permit a benevolent government to assume more and more responsibility for housing, feeding, hospitalizing, and even entertaining our citizens, we must in return expect to surrender more and more of our personal rights and liberties.

Actually, the only security any man can enjoy with liberty is the security he earns through his own initiative, resourcefulness and productivity. As community leaders, it is our responsibility to help our fellow citizens realize that for the delusion of government-guaranteed security they are sacrificing liberty.

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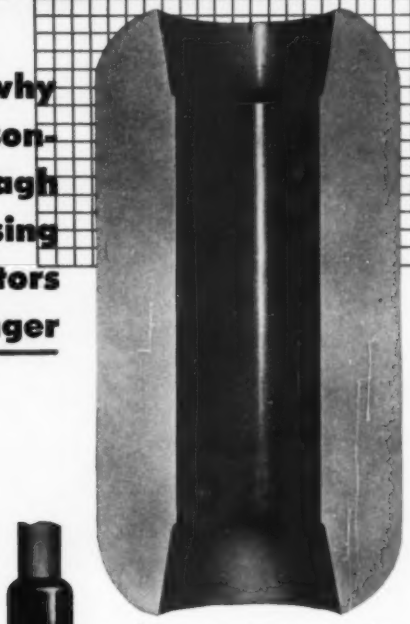
Cross Section of Quality

or why Patterson-Ballagh Casing Protectors last longer



These tapered recesses allow less stretching at the ends, keeping stress here less than in thick body when Protector is installed, thus eliminating tearing at this vulnerable point.

Quality Protectors come from quality workmanship in the shop and laboratory. This new shock-proof, tear-resistant Casing Protector represents endless hours of testing in both laboratory and field. Now it is *field proven* and ready for your drill pipe.

This new design meets the rough use and abuse of deep drilling. Engineers know that rubber under less stress will withstand more shock and tearing action than highly stressed rubber. Since the ends of a protector take the greatest beating down the hole, the tapered ends of the new Patterson-Ballagh Protector are not stressed as highly as the body, yet they grip the drill pipe firmly and prevent any fluid from getting between the rubber and drill pipe. These resilient ends allow the Protector to absorb shock and resist tearing action at this point.

To further insure proper rubber stress, *every Protector is designed for one, and only one, size drill pipe.* Call your Patterson-Ballagh man and have a new Protector installed on every length of drill pipe.

Tensile testing machine tests rubber samples from each batch of rubber to insure quality control.

This machine tests the abrasion-resistance of rubber samples—another example of why we know our Protectors will give long wear.

Rubber samples are aged, equivalent to two years, in a few hours time in high pressure oxygen ageing equipment.

The resistance of rubber under tension to hot oil is determined in this bath that simulates actual operating conditions.

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COMPLETE research facilities are only a part of the *great Flying Red Horse team* that contributes to the success of James Raymond and 46,000 Mobilgas dealers and jobbers like him.

The *high quality* of the products *you* buy . . . the *low price* you pay . . . *the very things that create opportunity and build business* for these thousands of independent businessmen . . . are results of integrated operation like this:

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. . . fast tankers transporting oil from *field* to *refinery* to *dealer* to *you*

. . . the efficient, co-ordinated hook-up of oil fields, pipelines, laboratories, refineries, and distribution facilities—*making shortcuts and savings* all down the line!

That's the kind of *competitive efficiency* that helps James Raymond to build his own successful business—that gives him the advantage of *bigness* right in his own home town.

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That's the kind of teamwork that makes possible *a big money's-worth for you*—at a small profit per gallon for us!

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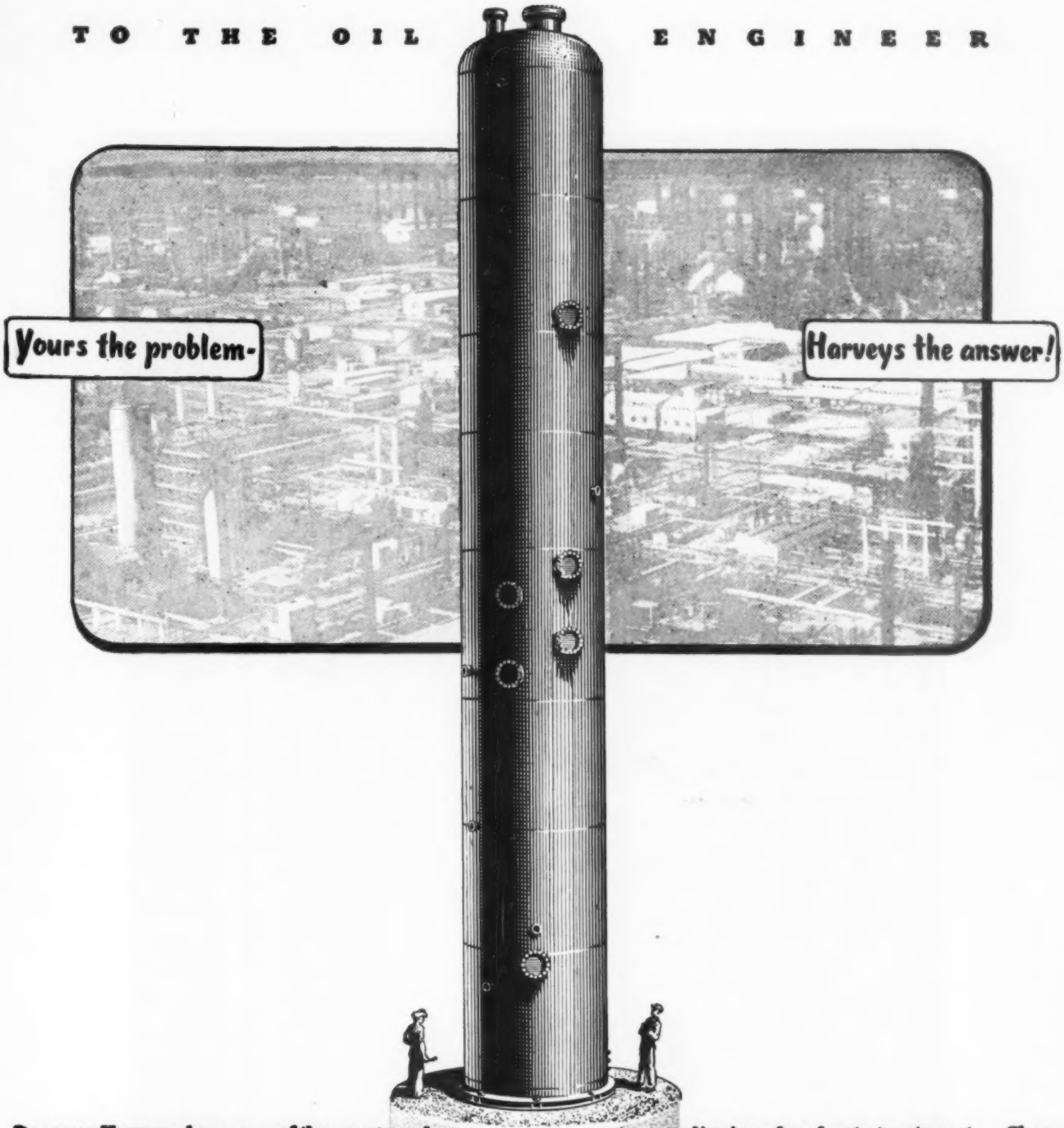
1,400 INDEPENDENT JOBBERS— 45,000 INDEPENDENT DEALERS—

Rely on the Flying Red Horse for <u>What</u> <u>You</u> <u>Want!</u>

SOCONY-VACUUM

TO THE OIL ENGINEER



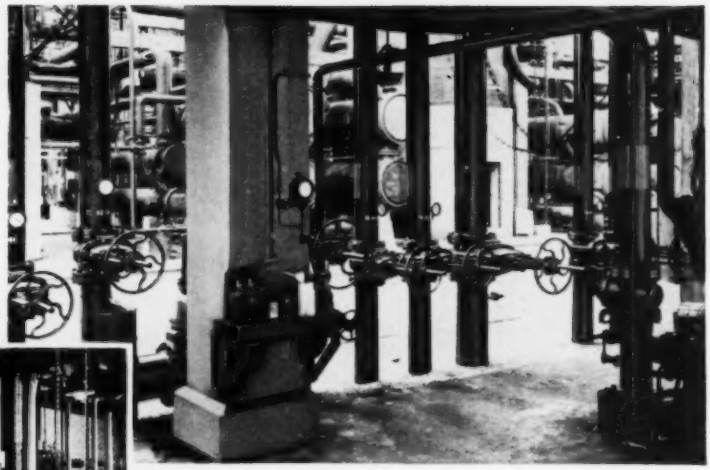
Because Harveys have one of the most modern and complete plants in the world, housing up-to-date welding equipment, operated by an experienced staff, they can supply the answer to even the most complicated plate-work problem. Fabricating mild, alloy, or clad steels they can produce installations to any of the recognised codes, including A.O.T.C., Lloyds, A.S.M.E. and A.P.I.-A.S.M.E. with, if necessary, X-ray examination and stress-relieving by heat treatment. Shop assemblies range from a few inches to 15′ 0″ in diameter ; pressure from absolute to 3000 lbs. per sq. in. This illustration gives but an impression of the type of flash Fractionating Tower that Harveys have produced for one of their overseas customers. Recent orders include Vessels 110 ft. high by 25 ft. in diameter, weighing up to 125 tons.

Send for Catalogue WP 750.

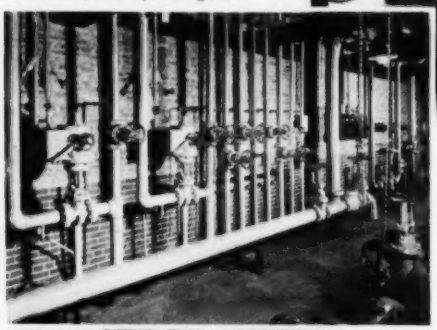
Harvey

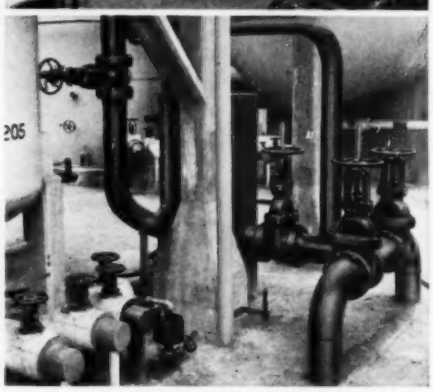
For every refinery piping need ...Look to the complete CRANE line

COOLING WATER SUPPLY LINES *to overhead condensers. Crane supplies all piping . . . in brass, iron, steel or alloys . . . for installations of this type.*



FIRE WATER PUMP *and header in cat cracker pump house. Crane equipment includes 125-pound iron body gate and check valves; motor-operated gates.*





GASOLINE TREATING PLANT *featuring steel and iron body gate valves from the complete Crane line.*

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When you depend on Crane, you don't have far to look. One catalog puts at your finger tips the world's most comprehensive selection of valves, fittings, fabricated piping, pipe and accessories. One order to your local Crane Branch or Wholesaler covers all equipment, for process, power and general utility piping installations.

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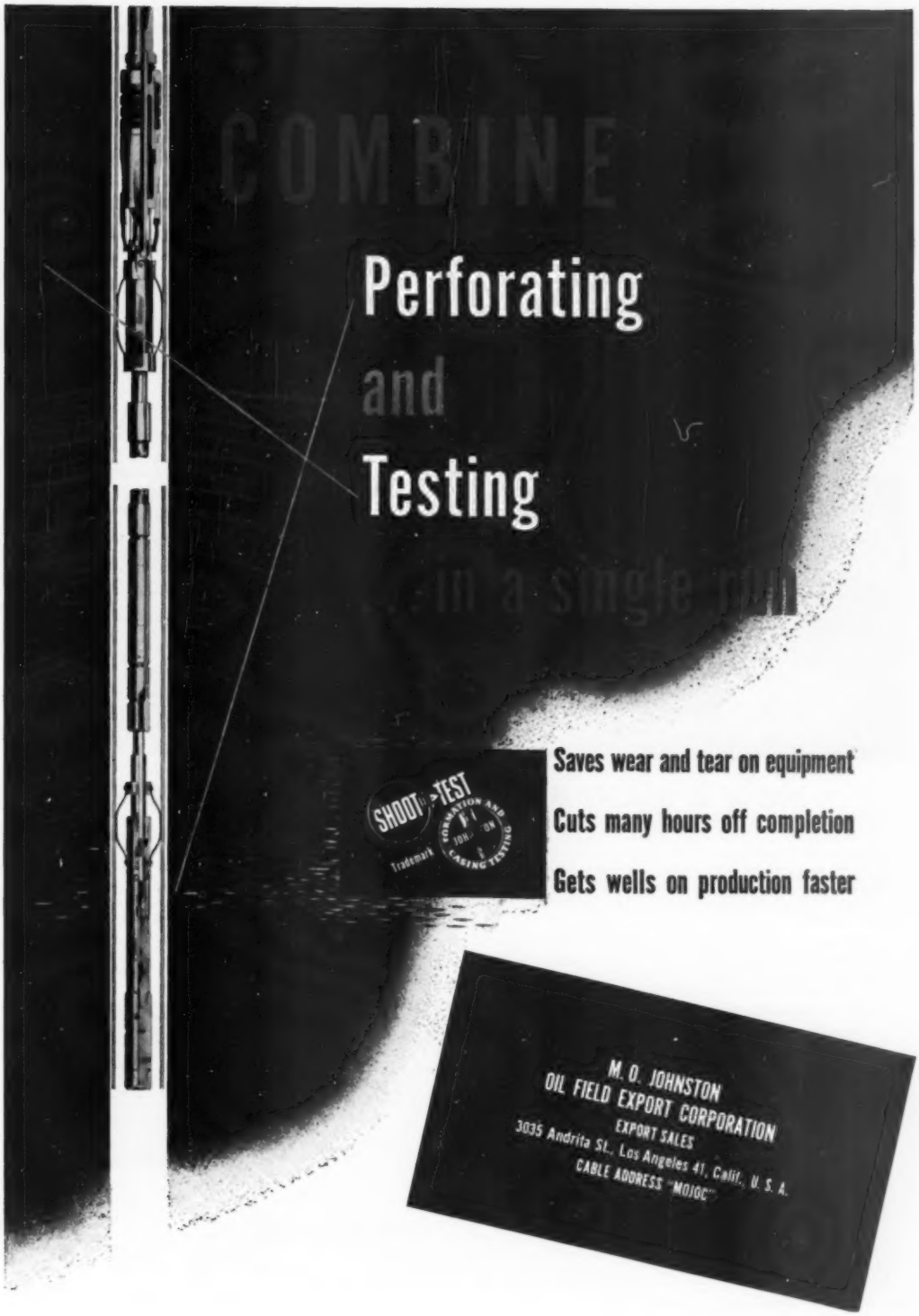
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N.B. While it is axiomatic that return on investment—the *ultimate earning power* of a refinery unit when actually on stream—is the only true evaluation of competitive engineering recommendations, initial plant costs remain a major factor in refiners' decisions on plant installations. M. W. Kellogg takes specific steps to *minimize initial plant costs* consistent with the achievement of *highest ultimate earning power.*

HOW A GIANT BENDER LOWERS "CAT" COSTS

In today's huge *Fluid* cat-crackers, catalyst lines are a transportation system for the equivalent of some 600 freight cars of material every 24 hour period. Fabrication of pipe big enough to handle this job (up to 60 inches in diameter) has always been time-consuming and expensive.

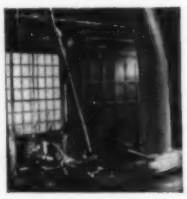
First, the curved pipe has always been tediously formed by welding together several, carefully-mitered sections. And then, the resulting irregular contour required the field-installation of wear plates to absorb erosion during on-stream periods.

To accomplish fabrication economies in this important part of the modern "cat", Kellogg's mechanical and metallurgical specialists produced something that had never been made before. They made *continuous one-piece* bends—in diameters up to 96 inches—by creating an *exclusive pipe-bending machine.*

All latitudinal welding, all special mitering is eliminated. In addition, because the insides of these new bends are smooth and in a continuous arc, wear plates are unnecessary . . . reducing field labor on just this one refinery part *by more than* 50%.

Thus the giant bender brings *initial savings* in addition to long-term protection . . . providing improved operating characteristics, radically lower maintenance costs and a reduction in down-time during turn-arounds.

This accomplishment could result only from pooling the talents and knowledge of an *integrated* organization, such as Kellogg, which includes fully-staffed groups versed in all phases of refining engineering, equipment fabrication and plant construction. Savings shown in this case history reflect only a small part of the overall opportunity for lowering costs, but they do emphasize that *completeness and integration* of the engineer-contractor are the soundest approach to LOW INITIAL PLANT COSTS.



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Fluid Synthetic Cracking Catalyst

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SERVICE—Davison offers complete laboratory and testing facilities for catalyst evaluation.

Add to these factors the close laboratory control of production to assure consistently high standard of uniform material, and you can see why Davison enjoys the position of catalyst supplier to many of the world's leading refiners. Bringing your catalyst problems to Davison can pay off in time and money.

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Davison fluid synthetic silica alumina cracking catalyst is available in three grades...

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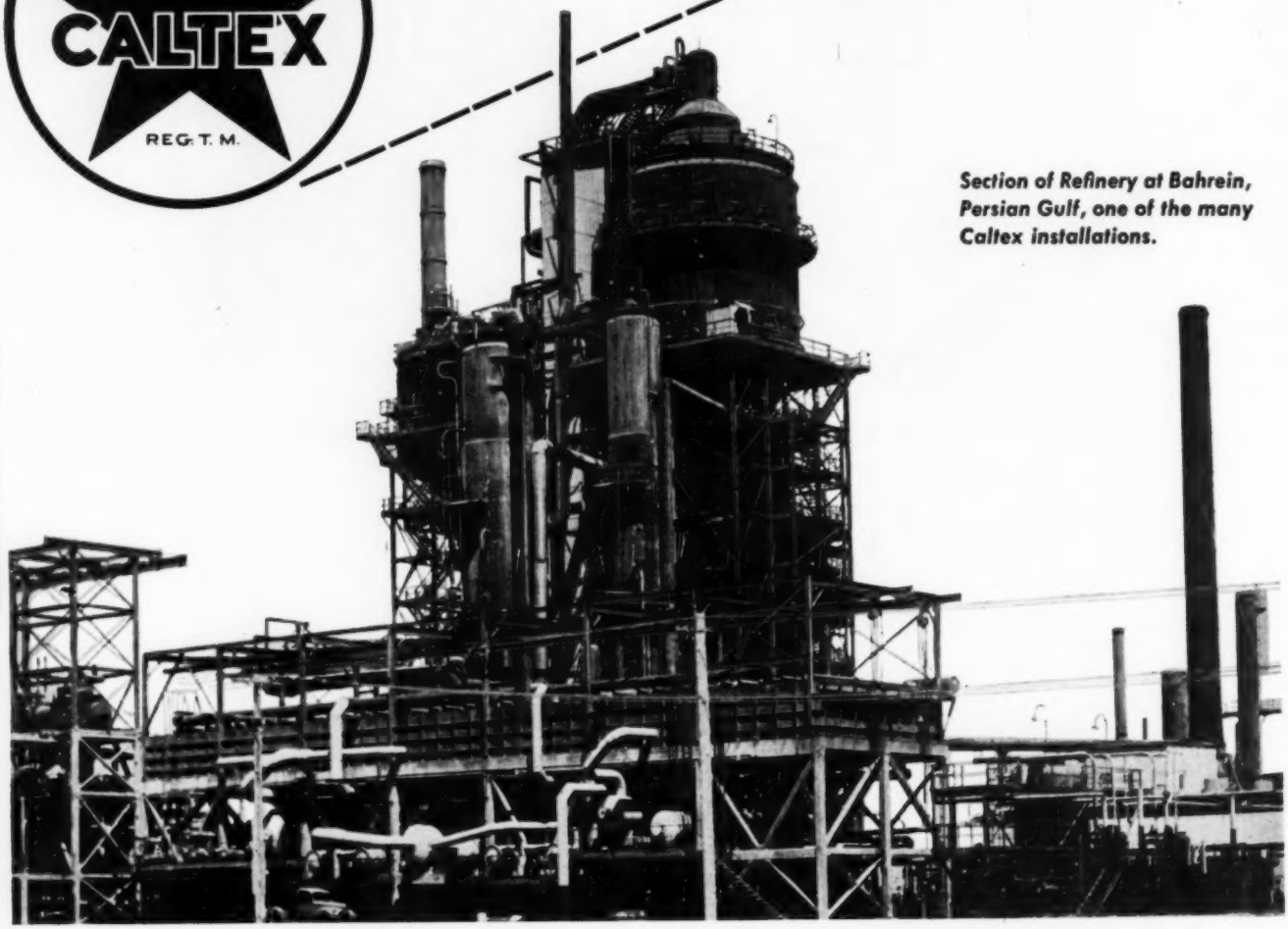
for greater operating efficiency and economy in all these world markets...

Throughout a large part of the world Caltex is a trusted name. It is the mark of high quality for petroleum products. It provides convenient, reliable and uniform sources of supply at principal ports and terminals. And the use of Caltex products assures maximum output at minimum operating costs.

Caltex has achieved this position through its vast resources in production and refining. Through its research and marketing facilities. By providing skilled technical aid to see that Caltex quality petroleum products are applied correctly for greater efficiency and economy.

CALTEX
REG. T. M.



Section of Refinery at Bahrein, Persian Gulf, one of the many Caltex installations.

CALTEX PETROLEUM PRODUCTS

Offices in U. S. A.: 551 Fifth Avenue, New York 17, N. Y.

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QUALITY in world famous W-S Forged Steel Fittings starts with proper selection of basic metals. Long before problems of forging, machining and testing arise, W-S technicians concern themselves with end uses in the determination of proper steel analysis for the various jobs Fittings must perform.

For example, working closely with Refinery engineers, W-S technicians helped establish standards for the physical properties of various fittings alloys . . . were first to use fittings materials of closely controlled uniformity (low sulphur-low phosphor) for the special demands of refinery services.

And, W-S has kept pace with changing methods in other processing industries too, meeting each new challenge with stronger, tougher alloys, producing forged steel fittings always correct — metallurgically.

They meet the broad, diversified needs of all industry and are available in both screw and socket weld types. Forged and precision machined of stainless, carbon and alloy steel . . . . Investigate.

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ROSELLE, NEW JERSEY

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Designers and Manufacturers of Forged Steel Fittings, Valves, Wire Rope Shears, Hand Pumps, Jacks, Pipe Benders and Hydraulic Equipment

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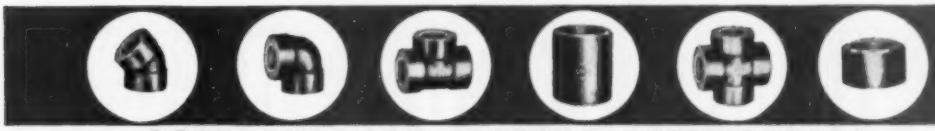

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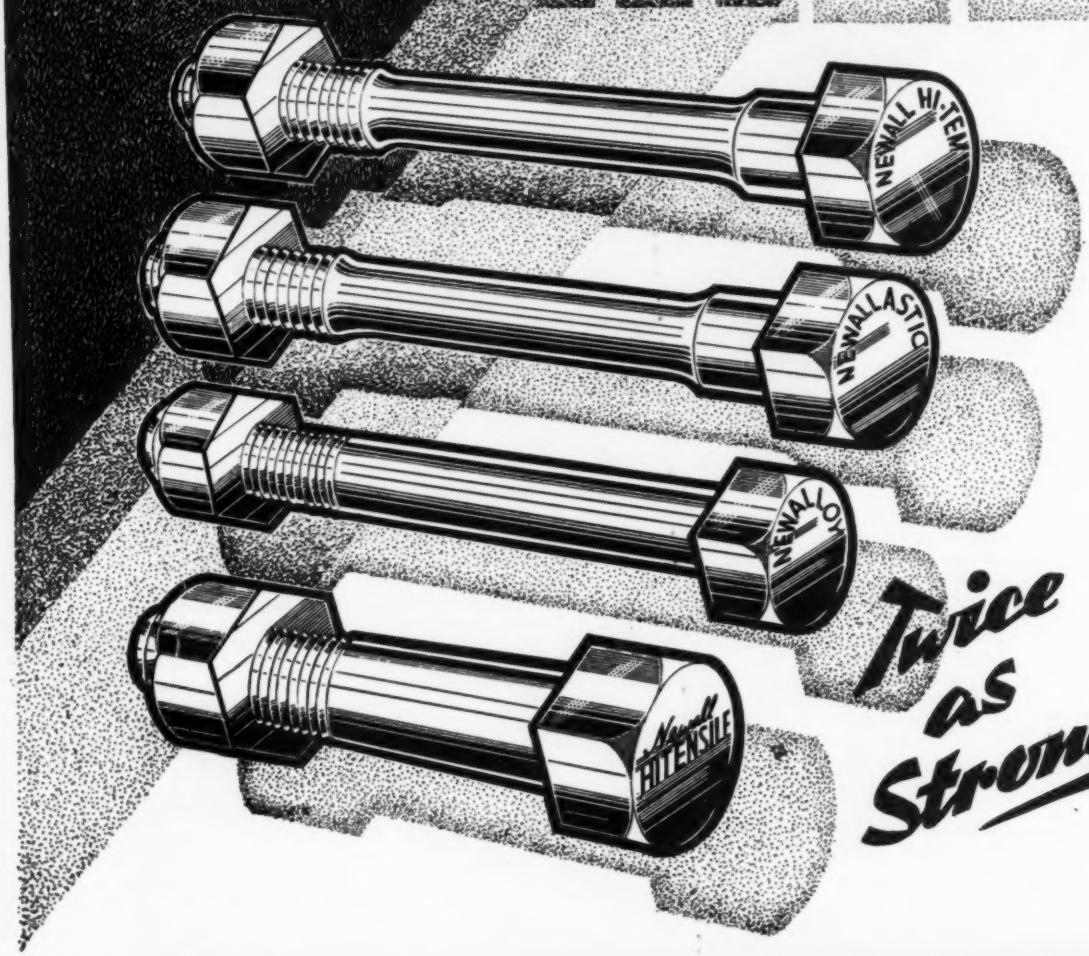

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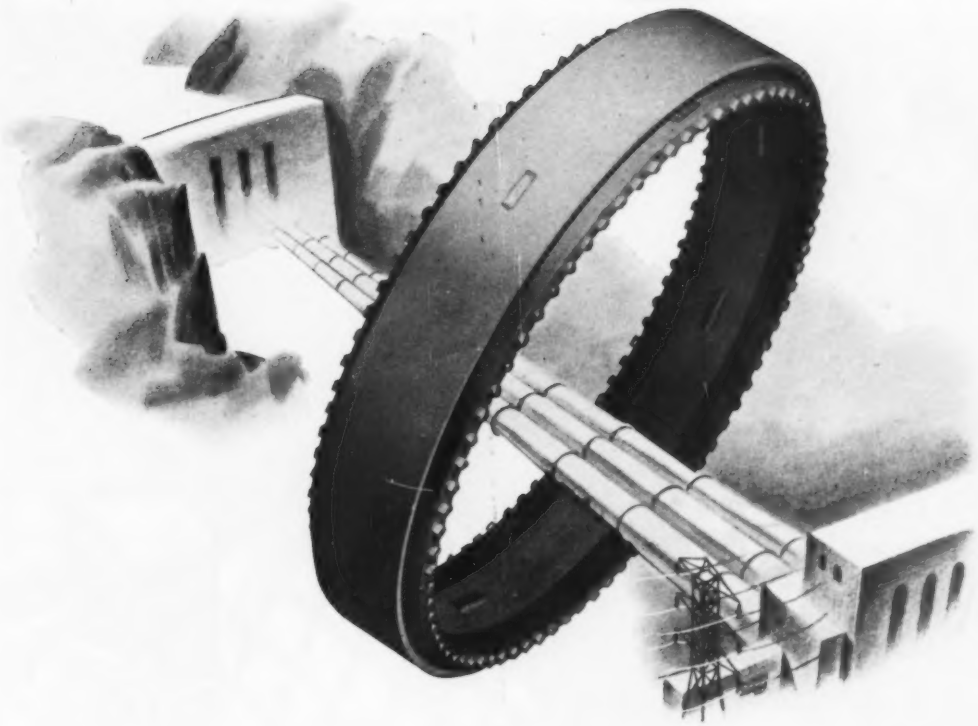

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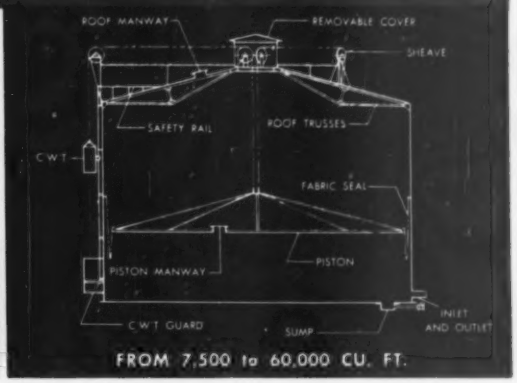

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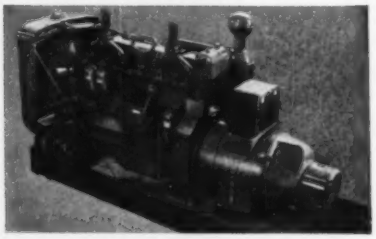

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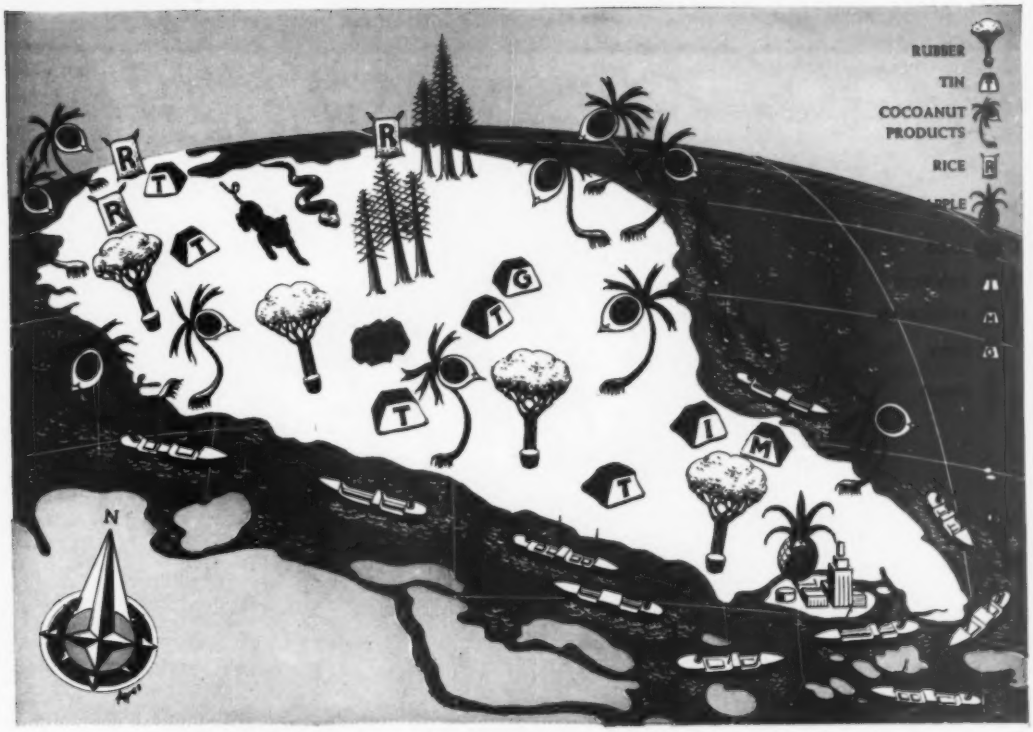

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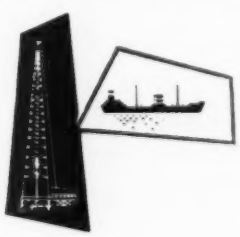

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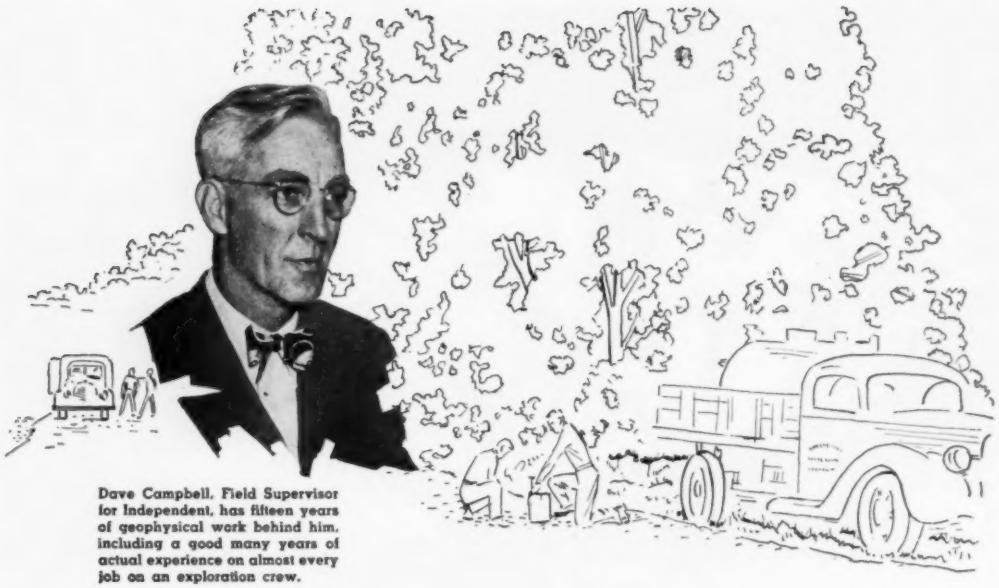

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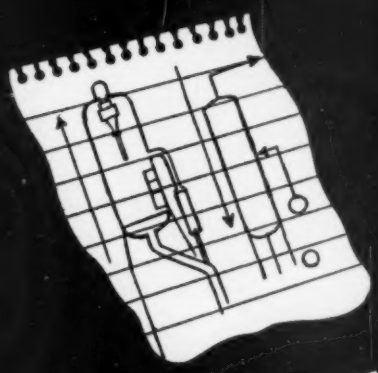

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This Month's Cover

Reproduced on this month's cover is a painting by Jackson Lee Nesbitt of Kansas City, commissioned by Humble Oil & Refining Co. The 36-year-old artist has won a number of awards and scholarships for his detailed, realistic portrayal of industrial and rural subjects. This particular painting of Humble pipe still No. 3 was done in egg tempera. Color plates are reproduced through the courtesy of *The Humble Way*, house magazine of Humble Oil & Refining Co.

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Our feeling, as we complete a quarter-century of service, is one of deep-felt appreciation. We are grateful for loyal employees, for exceptional opportunities and for the confidence and good will of the industry we serve. It is the confidence of our customers that made possible our growth, their good will that inspires our plans and guides our policies . . .

EDITORIAL

INTERNATIONAL OIL SITUATION IN TRANSITION

LOOKING back no more than eighteen months enables one to gain a clear picture of the transformation that has taken place in the oil situation within that relatively brief period. At the end of 1947 the oil industry of the United States was engaged in a race under serious handicaps to keep pace with the swiftly rising demand for petroleum products, a race that was to end in overwhelming success within the following year.

In Washington, however, official thinking was obsessed by alarm at the prospect of imminent shortage, by the conviction that the country had reached its limit in oil production and that its reserves would soon be exhausted. Official reaction to this mental state expressed itself in typical fashion: in Congress by the appointment of numerous committees to investigate the situation; in administrative circles by proposals for federal intervention, including erection by the government of plants for the manufacture of synthetic products.

It was during the state of alarm at an apparent oil crisis confronting the country that the first blueprint of the European Recovery Program came up for consideration. The Committee for European Economic Cooperation had prepared a carefully detailed plan specifying the quantities of different commodities required to accomplish the aims of the program over a four-year period. Among these, petroleum had a conspicuous place with a specification of $2.5 billion for dollar oils to be supplied largely, it was assumed, from concessions held by American companies in other lands.

Although sentiment was favorable to the general purpose of the program, the petroleum feature raised a great deal of apprehension. Congress insisted upon a directive to the management of ECA to purchase petroleum for the sixteen nations included in the recovery program so far as possible from countries other than the United States.

The development of a large European refining industry to be fed principally by Middle East crude was an integral part of the original European Recovery Program. The purpose was to lessen the drain upon the participating countries for dollar exchange and at the same time to reduce a demand upon the United States for refined product exports which it was felt the country could not continue to meet without deprivation of its own consumers. The original CEEC report proposed an increase of European refining capacity to 35 million tons by 1951. The prospect of assistance in developing a substantial refining industry proved so attractive to several of the ECA countries that they quickly developed projects for plants sufficient not only for their own requirements but with a margin for export to their neighbors. Since the neighbors were engaged in similar plans, the outcome was an aggregate program far above original contemplation. Not all these plans were based on ECA financing. Several companies with production in the Middle East or elsewhere overseas decided to erect large plants in Europe. Completion of these projects would have given western Europe by 1953 a refining capacity of over 65 million metric tons which, with imports of 18 million tons from overseas subsidiaries of European companies, would leave a balance for export of 10 million tons.

It is the possibility of such a situation that is causing some concern among a segment of American oil men who wonder where such a potential supply would find a market or whether it might lead to destructive competition that disrupts international markets, such as the industry has experienced on occasion in the past. ECA officials express the opinion that when the individual country plans are added together, "the European import-refining-consumption-export picture does not represent a well-balanced oil economy". ECA may be depended upon to screen carefully any projects requiring its approval, but, of course, it exercises no control over plants financed by individual companies.

Regardless of these projected developments, it does not necessarily follow that the oil industry will be menaced by a period of excess production. If European recovery progresses as expected, the demand for petroleum products may be substantially greater than now estimated. Other parts of the world which have not been large consumers in the past already show signs of greatly increasing their market requirements. In the past world demand has shown a consistent ability to expand rapidly whenever a prospective surplus appears to be in sight.

One noteworthy change in the international situation is certain as a result of the great expansion in European refining now getting under way. Aside from the United States, which has been practically self-contained, western Europe has long been the most important market for petroleum products. It has drawn its supplies from both continents of the western hemisphere, from Iraq and Iran in the Middle East, and from southeastern Europe up to the time when Romania disappeared behind the Iron Curtain. With Europe capable of supplying its own requirements of products processed from crude that undoubtedly will be drawn mainly from sources controlled by European companies, those countries producing a surplus of refined products will have to look elsewhere for its disposal.

Cooling towers for gas plant in the La Paz field. Shell Photo.

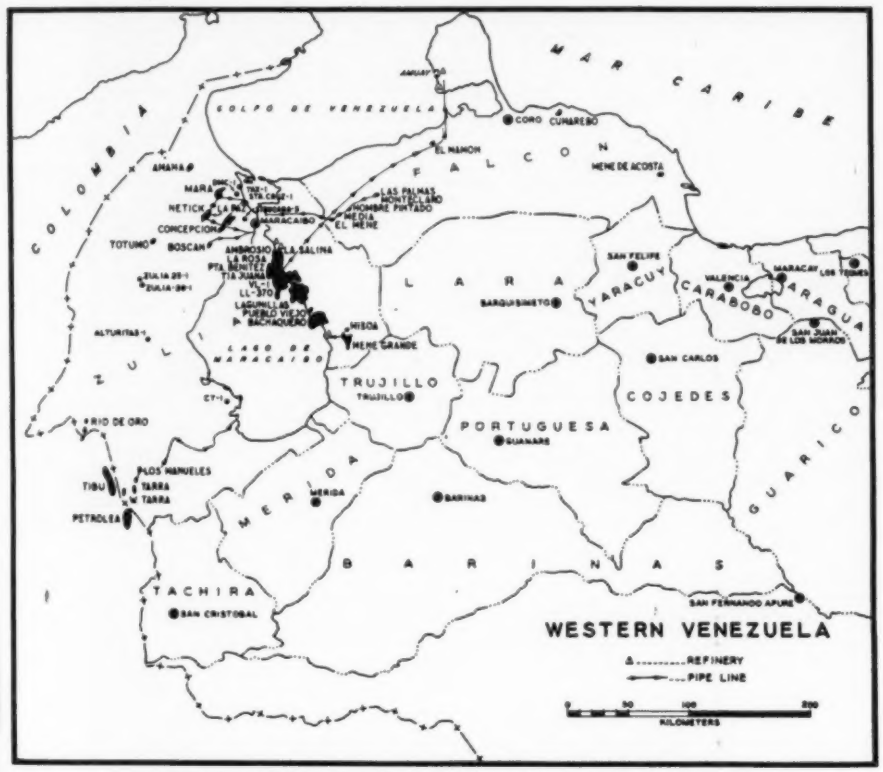
CRETACEOUS PRODUCTION IN WESTERN VENEZUELA

By Anne Newman Sutton

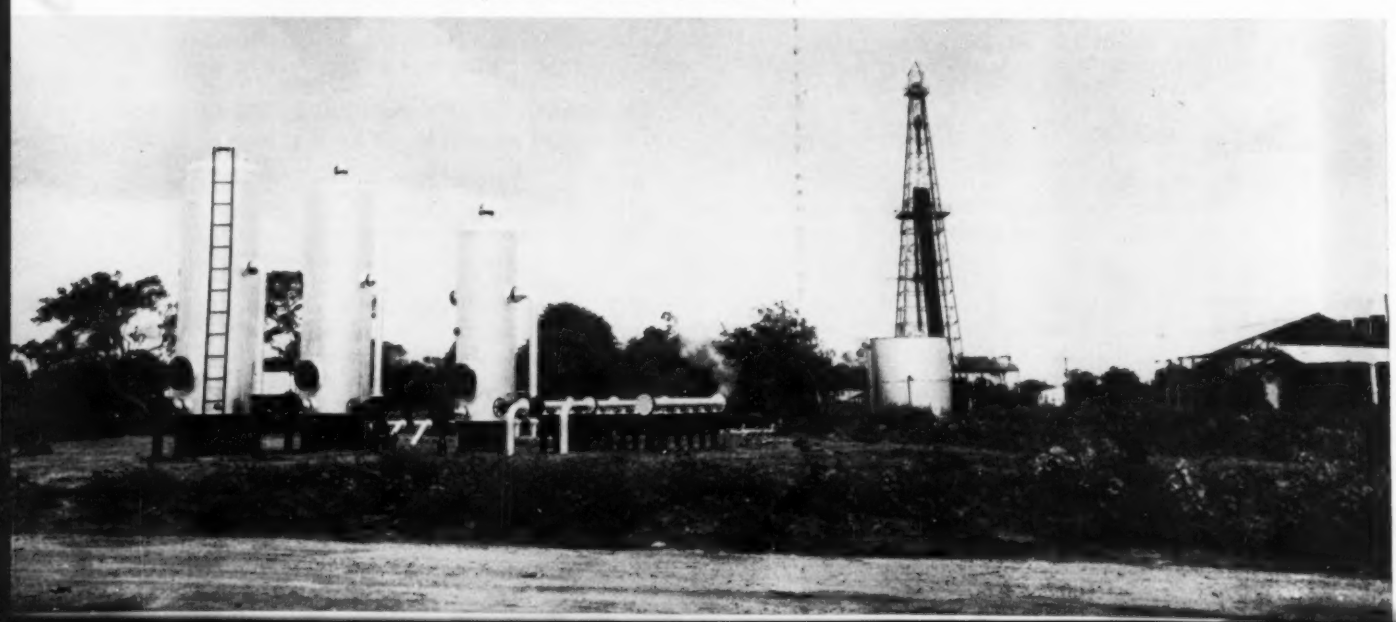
THE presence of oil in the Cretaceous rocks of western Venezuela has been known for many years, as evidenced by the numerous oil seepages issuing from the outcrops of these beds along the front of the Perijá Mountains and also from early wildcat wells drilled east of the mountains. Commercial production, however, was not discovered until 1944, although prior to this the Barco concession of Colombia, in the same basin, was producing from the Cretaceous. At the present time all Cretaceous production in western Venezuela is limited to the area west of Lake Maracaibo on the western limb of the Maracaibo basin.

Production is confined to the limestones, and although no information has been released showing the thickness of the section in the producing fields, it can be estimated rather closely from the published reports. The table on page 31 summarizes the stratigraphy of the Cretaceous section where it is exposed in the Perijá Mountain foothills west of the main producing fields.*

From the above it will be noted that there are approximately 1,950 feet of predominantly limestone section from the basal Colón formation to the pre-Cretaceous basement, and it is from this interval that production is obtained. It is com-



Below: Creole Petroleum Corporation's MA-5 drilling. Creole Photo.



*Geology of Maracaibo Basin, by F. A. Sutton, Bulletin of American Assn. of Petroleum Geologists, Oct., 1946.

Cretaceous Section Northern Perijá Mountain Front

Formation	Average Thickness (feet)	Description
Upper Cretaceous		
Mito Juan-Colon (Soucy Ls. at base)	1500	Dark gray to black, massive shale & sandy shale. Basal 100 feet composed of shaly, petroliferous limestone.
La Luna	400	Black, thin bedded, calcareous shale & limestone. Limestones generally bituminous & emit strong odor of petroleum when freshly broken
Middle & Lower Cretaceous		
Cogollo group Capacho	550	Thick bedded, massive, fossiliferous limestone with thin sandstone & shale beds. Commonly petroliferous.
Aguardiente	50	Glauconite zone. Petroliferous on Rio Cogollo.
Apón	850	Thick, bedded to massive, gray, dense, fossiliferous limestone with thin inter-bedded shales & sandstones. Locally oil stained. Fine conglomerate at base.
Basement		Ingneous and metamorphics.

mon practice to produce the wells with the entire limestone section open so that the exact position of the different producing horizons probably is not known. It is safe to infer, however, that La Luna is the main producing formation, especially in La Paz and Mara fields. The limestones have low primary porosity and the present flush production is believed to come from fissures and fractured zones.

The La Paz field is located on La Paz anticline in the District of Maracaibo about 28 miles west from Maracaibo City. Attention was probably first drawn to this locality by the large oil and asphalt seepages which cover an area of about 15 acres on the crest of the fold. The structure trends about N 35°E and occupies a high structural position on the southern part of La Paz-Mara uplift. Early studies revealed the near surface presence of Upper Eocene sediments, and it was possible by pitting to outline the fold over an appreciable distance and define its flank contacts with overlying sediments. The structure is generally asymmetric, with a steep west flank and broad gentle east flank and is severely faulted along the crest.

The field was discovered in 1925 by Venezuelan Oil Concessions Ltd. (Shell subsidiary), but early drilling was confined largely to the crestal and immediately adjacent flank areas. Production was mostly from the Paleocene, with small amounts from the overlying Eocene. It was a field of shallow production, and the first 35 wells completed had an average depth of only 1,400 feet.

The Cretaceous discovery well, P-62, was completed temporarily in May 1944, on the east flank of the structure. It did not penetrate the entire Cretaceous section and was only a small producer. The well was later deepened to 4,800 feet and has since produced substantial amounts of oil. In August of the same year, well P-68 was completed near the original discovery at total depth of 5,397 feet and showed an initial gauge of about 5,000 barrels per day of 33.4° API gravity oil through a 5/16-inch choke. This well was the first large-volume producer from the Cretaceous and initiated the extensive search for Cretaceous oil that has since developed.

Since the discovery in 1944, a total of 18 wells have been drilled, and four are now drilling. Of those already drilled, 16 were completed as producers, one was dry, and one was shut in because production could not be maintained. The wells are spaced at 1,200 meters (4,724 feet), or one well per 125 hectares (308 acres). Depths vary from 4,800 feet to 9,780 feet, with an average of about 7,500 feet. It is common practice to cement 7-inch or 9 5/8-inch casing on top of the first limestone, drill 5 7/8-inch hole to total depth, and produce "barefoot." Many, but not all of the wells have penetrated the entire lime section to basement. In some cases circulation is lost and the well cannot be drilled to the desired depth. All wells are acidized before being placed on the flow line, and this may be repeated as production declines. Tubing is generally run deep in the hole, and the wells produced through both tubing and casing on chokes ranging from 3/16 to 1½ inches. Well head pressures vary from 200 to 1,650 psi and the average GOR is about 600.

Initial gauges have varied from a few hundred to many thousands of barrels daily, with the overall average in the neighborhood of 4,245 barrels. The average gravity of the oil is 33.2°.

As of February 28, 1949, La Paz field has produced a total of 96,551,500 barrels, and the present producing rate is about 127,000 barrels daily. With the exception of Bolívar Coastal field, La Paz is now the major producing field in Venezuela and probably rates second to the Bolívar Coastal field in reserves.

The Mara field is located in the District of Mara, about 21 kilometers northeastward from La Paz and on the northern end of La Paz-Mara uplift. The structure is reflected in the topography and is outlined clearly at the surface in an area of Eocene sediments which are partially encircled by overlapping Miocene beds. The uplift terminates abruptly on the northwest against a major northeast-southwest trending fault, downthrown to the west. All production to date has been found on the upthrown side of this fault.

Many years ago two shallow cable tool holes were drilled on the Mara feature in a search for Eocene production, but the results were disappointing. In March 1945 the Cretaceous discovery well, DM-2, was drilled by the Shell Caribbean Company on the northwest part of the structure and near the major fault. The well was bottomed in La Luna formation at total

Gas Separating system in the La Paz field. Shell Photo.

Storage facilities in the La Paz field. Shell Photo.

depth of 6,011 feet and came in for about 2,000 barrels per day of 29.7°API gravity oil through a 3/8-inch choke with CHP of 1,300 psi and THP of 1,600 psi. Since the discovery a total of 25 wells have been drilled, of which 22 were completed as producers. The producing section is similar to that at La Paz, and the wells are completed in much the same manner.

The depth to the Cretaceous lime section at Mara is generally greater than at La Paz, and well depths vary from 6,011 feet in the discovery well to 11,026 in MA-5. The overall average depth is about 8,800 feet.

The Shell Caribbean Petroleum Company is the principal owner and operator at Mara, although Creole, Texas and Mene Grande have substantial interests in the field.

Of the 22 successful completions to date, ten are owned by Shell Caribbean, five by Texas, four by Creole and three by Mene Grande. At the present time, nine wells are drilling of which three are for account of Shell Caribbean, two for Creole, two for Texas and two for Mene Grande.

As of February 28, 1949, the Mara field had produced a total of 33,532,718 barrels of oil and has a present daily production of 72,000 barrels. The average gravity of the oil is 28.8°API or about 4.4° lower than that at La Paz. The wells are generally produced through both casing and tubing on chokes ranging from 3/8 to 1½ inches. Pressures at the well head vary from 200 to 1,400 psi and the average GOR is about 600.

All Cretaceous production from La Paz and Mara is handled through Shell Caribbean's pipeline system which terminates at Palmarejo on Lake Maracaibo, about 20 kilometers east of the Mara field. From this terminal the oil is transported by shallow draft tankers to the refineries or deep-water terminals of the respective companies.

The La Concepción field is situated about 25 kilometers (15 miles) west from Maracaibo City and occupies a high structural position on the southern part of the Concepción-Cañadones uplift, a broad regional feature which trends northeastward through the districts of Maracaibo and Mara, Zulia. This uplift is about 19 kilometers southeastward and parallel with the La Paz-Mara trend. The structure of La Concepción is rather complex and comprises at least two small crestal faulted folds which show local closure in the Eocene which is exposed at or near the surface. The field was discovered in 1925 by Venezuelan Oil Concessions, Ltd., and until 1948 production was entirely from the Upper Eocene and at depths ranging from 1,200 to 2,000 feet.

In August 1948 well C-148, a deeper pool test in the center of the field, was completed in the Cretaceous limestone at total depth of 12,085 feet. The initial production was 1,541 barrels daily of 37°API gravity oil through a 2-inch choke with CHP of 850 psi and THP of 239 psi. Data on the producing interval or formation is not available. As of February 28, 1948, total production was 278,704 barrels, and the present production rate is about 1,600 barrels daily.

The Sibucara field is situated about ten kilometers west of Maracaibo City on a trend which lies parallel with and about ten kilometers southeast of the La Concepción-Cañadones trend. The structure is anticlinal and is clearly defined at the surface in a area of Upper Eocene beds encircled by overlapping younger sediments. Early drilling in a search for Eocene production was disappointing, although appreciable quantities of gas were found at relatively shallow depths.

Sibucara-5, a deep test, was completed in January 1949 as a Cretaceous lime producer at total depth of 13,451 feet. The initial gauge showed a daily production of 4,302 barrels of 36.6°API gravity oil through 1¼-inch choke with CHP of 2,730 psi and THP of 1,281 psi. Additional data are not available. As of February 28, 1949, Sibucara-5 had produced a total of 321,784 barrels of oil and at the present time is reportedly able to produce as much as 5,500 barrels daily. This field is owned by Venezuelan Oil Concessions Ltd.

The Netick field is located in the southern part of the District of Mara, about 11 kilometers (six miles) northward from La Paz field and on the regional La Paz-Mara trend. The structure is closely associated with the southern extension of the major Mara fault. Upper Eocene beds have been faulted up against sediments of late Miocene and local closure developed along the upthrown or eastward side of the major fault. The structure is complicated by subsidiary faulting and folding.

The Netick field was discovered in 1929 by the Orinoco Oil Company (Pure Oil), and a total of seven wells have been drilled. Commercial Eocene production in small amounts has been obtained from three of these wells. In May 1948 well Netick-7 was completed at total depth of 10,156 feet in Cretaceous limestone. Nine and 5/8-inch casing was cemented at about 8,300 feet, and the open hole to bottom was acidized. After flowing several heads of 200 barrels, the casing collapsed and the well was suspended.

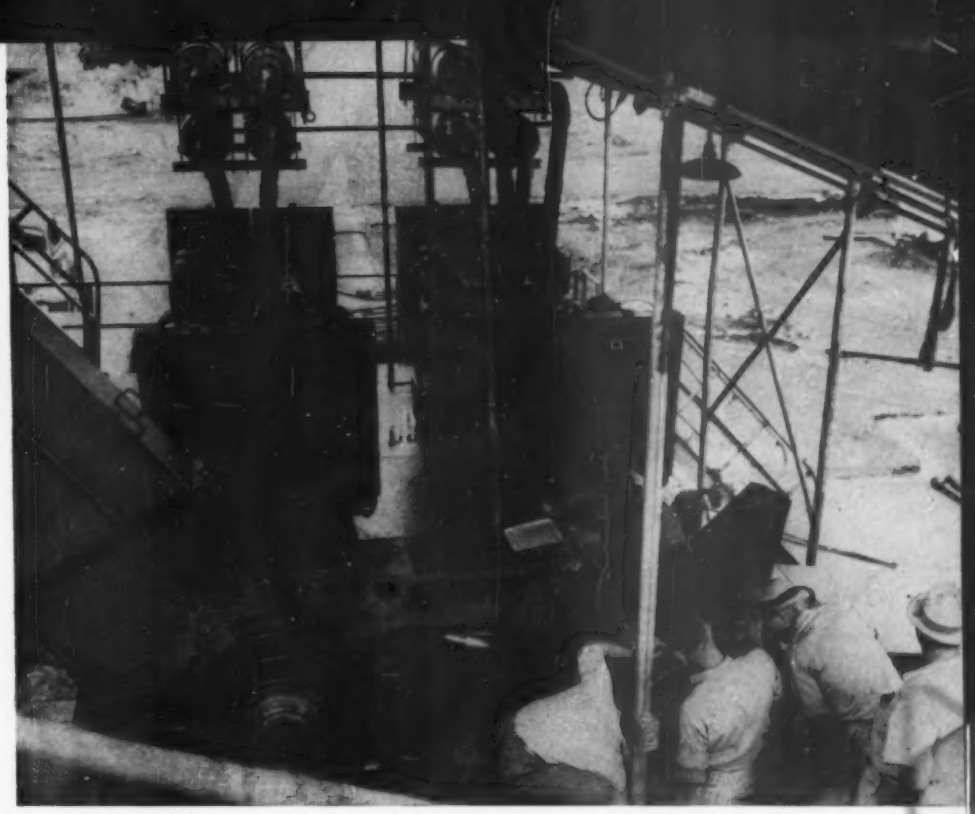
In October 1948 the Netick field was purchased by Mene Grande Oil Company, but to date no further development work has been done. This field has excellent prospects for Cretaceous production.

Well Zulia 26-1, a Richmond Exploration Company wildcat, is located about 17 kilometers northeastward from Machiques in the District of Perijá, Zulia. It was completed in December 1946 as a Cretaceous lime producer at total depth of 11,540 feet with an initial flow of 800 barrels daily of 32°API gravity oil. The well is located about ten kilometers eastward from the Cretaceous outcrop belt in the foothills of the Perijá Mountains. No further data are available.

The fields and wells discussed above are all located in the northwestern part of the Maracaibo basin. The West Tarra field is located in the extreme southwestern part of the basin in the District of Colón, near the Colombian border and not far from the Cretaceous fields of the Colombian Petroleum Company in the Barco concession. It is situated about ten kilometers west of the Tarra field which was discovered in 1916 by the Colón Development Company, a subsidiary of the Shell Group. This field has been a steady producer from the Eocene since its discovery.

W-2, discovery well for the West Tarra field, was completed as a Cretaceous limestone producer in June 1947 at total depth of 9,173 feet for about 1,500 barrels per day. Since the discovery two additional wells have been completed with initial flows of 200 to 300 barrels daily. One rig is active in the field. The present rate of the field is about 1,500 barrels daily, and the outlet is by way of the Tarra field to La Solita pipeline terminal on Lake Maracaibo, about 125 kilometers from Tarra.

At the present time a number of exploratory wildcats are being drilled with the Cretaceous as their objective. In the District of Mara on the Cañadones anticline, Shell Caribbean's DMC-1 and Creole's TAX-1 are drilling at depths below 6,000 and 8,000 feet respectively. The Cañadones anticline is a local feature on the Concepción-Cañadones uplift about 15 kilometers east of the Mara field. The structure is outlined at the surface in an area of Eocene outcrops in contact with overlying younger sediments.



Diesel power equipment on rig in area northwest of Maracaibo. Creole Petroleum Corporation Photo.

Creole's Santa Cruz-1 is drilling below 12,000 feet on the Santa Cruz anticline, an Eocene structure located on the shore of Lake Maracaibo about 19 kilometers northward from Maracaibo City.

About 30 kilometers southeastward from Machiques in the District of Perijá, Creole is drilling Alturitas-1, a Cretaceous test on the large Alturitas structure which lies about 30 kilometers eastward from the front of the Perijá range. This well is now drilling below 9,000 feet.

Creole's well LL-637 in Lake Maracaibo is drilling below 12,000 feet to test the Cretaceous.

Since the discovery of the first Cretaceous production at LaPaz in 1944, the area west of Lake Maracaibo has assumed an ever-increasing importance in Venezuela's oil economy. It is believed that Cretaceous production from La Paz, Mara, Concepción, Sibucara and West Tarra fields will amount to at least one billion barrels of oil.

Creole wildcat at Santa Cruz. Creole Photo.

NEW RIVER TOW IS HIGH SPEED UNIT

Preliminary runs on the Missisippi and Ohio rivers of the recently launched "Sohio Cleveland", reveal a six-fold increase in hauling efficiency over an eight-year period of river craft development.

THE diesel-powered towboat, "Sohio Cleveland," launched at St. Louis on April 21 for the Standard Oil Co. of Ohio, is setting speed records on the Mississippi and Ohio rivers which the owners of the new vessel believe to be unique in the history of river navigation. On her first upstream trip from Mayersville, Miss., to Mt. Vernon, Ind., she averaged 8.04 miles per hour with a load of more than 62,000 barrels of crude. Average performance record was 500,000 barrel-miles per hour. Since then, three other trips have shown an average haul of nearly 520,000 barrel-miles per hour. On one trip the record was 540,000 barrel-miles per hour.

The new tow is approximately six times as efficient as a crude oil transportation unit as the company's first tow which was put into service eight years ago. That unit, the 1,000 hp "Renown" with a stillwater speed of 6.25 mph, had a performance of 87,000 barrel-miles per hour upstream. The "Renown" towed four barges of conventional type with a crude capacity of 34,000 barrels.

Standard of Ohio's next tow, the 1,200 hp "Sohio State," with six integrated barges and a capacity of 55,000 barrels, brought performance up to 150,000 barrel-miles per hour upstream. The steamers "Sohio-Latonia," "Sohio-Fleetwing" and "Sohio-Southern" with a greater horsepower rating and larger barge capacity give a performance of 275,000 barrel-miles per hour upstream. Speed is steady at 6.25 mph with greater performance created partly by more barges and greater power.

Since that time Standard has been increasing the speed of its vessels to obtain greater performance. The 2,415 hp "Sohioan," launched six years ago has a stillwater speed of 7.75 mph and with six integrated jumbo barges, built in 1946, has a performance of 460,000 barrel-miles per hour upstream. Recent additions to the fleet, the 1,500 hp "Elisha Woods" and the "National," each with three integrated jumbo barges, have a stillwater speed of nine mph or an upstream performance of 330,000 barrel-miles per hour.

Before she was launched, the new "Sohio Cleveland" was estimated to have a stillwater speed of 12 mph with three integrated jumbo barges filled with 60,000 barrels of crude oil. With the greater speed, it was calculated that the performance record would approximate 510,000 barrel-miles per hour upstream. This calculation appears to have been amply justified by the preliminary records as indicated above.

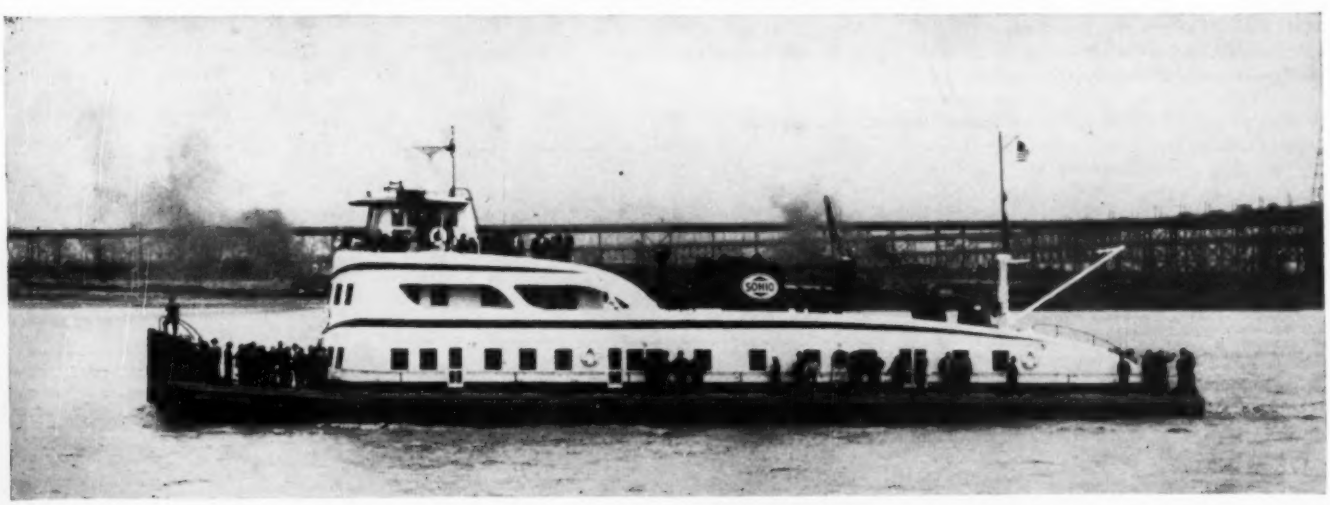
A large part of the improved performance of Sohio's newer tows is due to the advantage of propeller-driven boats over stern paddle wheelers, greater horsepower and refinements in boat design. More efficient barge designs have played a part also. With integrated tows water turbulence between barges has been minimized and resistance decreased. The integrated barges are squared at one or both ends, with the result that a complete tow, when made up, has the same profile as one long barge. Elimination of the rake of center barges in the tow also increases cargo carrying capacity.

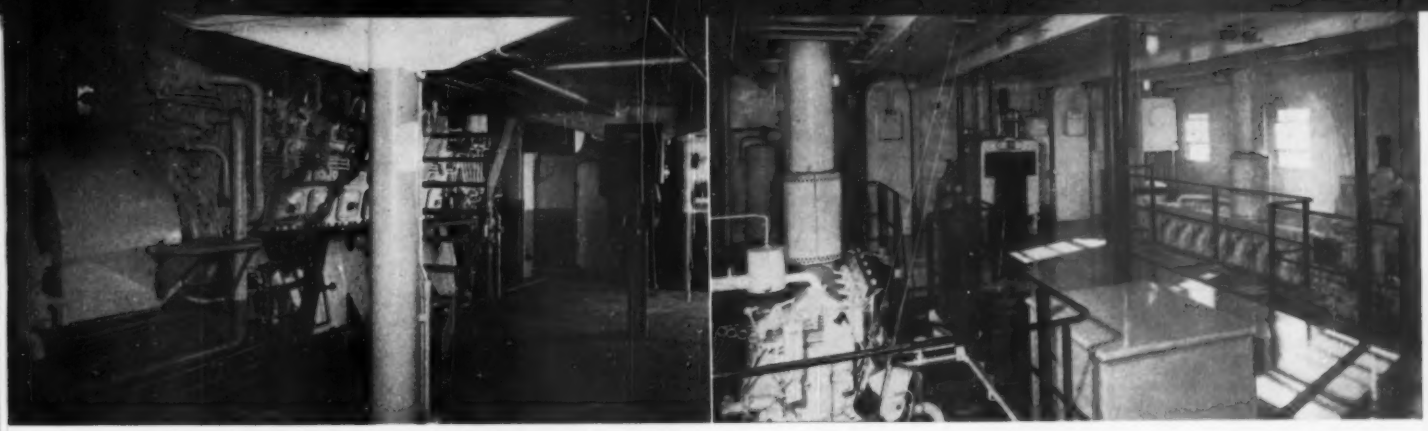
The new "Sohio Cleveland" was built by St. Louis Shipbuilding and Steel Co. with the following general specifications:

Length	150	feet
Beam	35	feet
Crew Quarters	15	
Guest Quarters	2	
Horsepower	3200	2 General Motors 1600 hp engines
Engine RPM	750	
Propeller RPM	214	
Propeller Diameter	8	feet
Fuel Capacity	77000	gal. (19 days supply)
Drinking Water Capacity	3000	gal.
Wash Water Capacity	8000	gal.

Special features include contra-guide rudders, a recent application to shallow-draft river tow-

"Sohio Cleveland" on trial run in the Mississippi after launching ceremonies on April 21.





Interior view of engine room of "Sohio Cleveland" powered by two 1,600-hp General Motors diesel engines. Lower deck of engine room at left and upper deck showing upper part of two engines is shown at right. Howard Earl Day photos.

boats of a rudder design which has been used for years on deep-draft ships on the ocean and lakes, The vessel has radar to permit navigation in periods of low visibility, an automatic pilot and ship-to-shore telephone. Pilot house control permits the pilot to control speed of the engines and direction of rotation of the propeller shafts. An aluminum dispatch boat capable of 38 mph is carried by the tow. This minimizes delays to the tow in picking up and dropping personnel, supplies and mail.

Three barges making up the "Sohio Cleveland" tow have the profile of a single barge 870 feet long and 50 feet wide. The bow and stern barges have long, easy towing rakes with the head log of the lead barge raised 3.5 feet above the loaded water line to minimize the possibility of "plowing under" at high speeds. At a draft of 8.5 feet the capacity is about 61,000 barrels, and at 9.5 feet it is 70,000 barrels.

Crew of the "Sohio Cleveland" is 14 as compared 19 on the "Sohioan" launched six years ago. This will tend to reduce operating costs below those experienced in the operation of previous tows.

Standard of Ohio has been engaged in a limited amount of barge transportation of gasoline on the Ohio river for a number of years to supplement its truck and pipeline deliveries. First crude oil transportation was undertaken in 1939 with the chartering of two 40-year-old stern-wheel steamboats and a miscellaneous assortment of barges. By 1946 the company had built its fleet to include five company-owned boats with 10,000 hp and 50 owned and chartered barges with a capacity of 463,000 barrels. In that year the barge fleet handled 24,000 barrels of oil daily a total of six billion barrel-miles. In 1948 the company transported 43,000 barrels of crude per day on the river.

An important element in keeping Sohio tows running on the Mississippi and Ohio has been the installation of radar. First radar scope was installed on the "Sohio Latonia" about two years ago and was an inportant element last year in permitting the company fleet to deliver an average of 43,000 barrels of crude daily to Standard refineries and pipeline terminals.

Use of radar on the river requires skill in picking out objects and identifying them at times of low visibility. River pilots find that the radar becomes more useful as they gain experience. The scope gives a clear, sharp picture of shore lines and the position of the tow with relation to these shore lines. It does a fair job of picking up buoys, other tows, even to small skiffs, bridges, lock walls and most other floating objects including drift. Even ducks have been picked up on the scope.

The trick is to identify the objects which show up on the screen. The pilot's problem is to determine whether the object is a government buoy, a log or a floating tree top. Each object must be studied to see whether it is moving with the current or stationary. Radar will not pick up lights, and Capt. William Howell of the "Sohio Latonia" recently suggested that a device should be installed on these which the radar will "see."

Navigating bends in the river by radar is tricky work, but Standard pilots are getting the necessary experience so that tows can operate safely in almost any sort of weather.

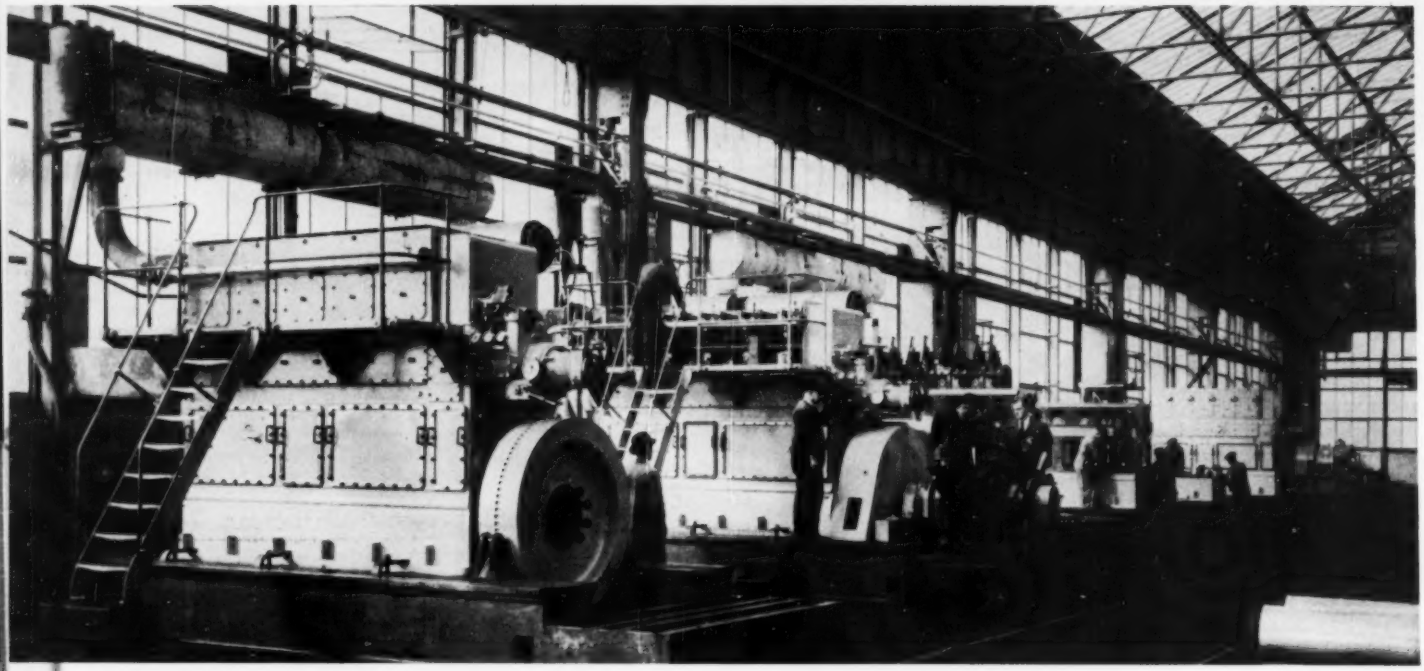
Sohio operates river terminals with an aggregate storage capacity of about a million barrels. Pumping rates at terminals have been speeded up to decrease turnaround time of tows. At Mayersville, Miss., for example, barges can be loaded at the rate of 10,000 barrels per hour, a rate that is comparable with that maintained at the most modern deepwater terminals loading ocean tankers. Sohio terminals are at Wyatt, Mo., Mt. Vernon, Ind., and Bromley, Ky., in addition to Mayersville.

Louisiana crude may be picked up at Gibson Landing, La., and other terminals as far south as the Gulf. Regular trips are made to Mayersville, Miss., which is connected to the Tinsley field by a Sohio pipeline. Much of the crude is unloaded at Mt. Vernon, Ind., from whence it is pumped in Sohio's pipeline system to refineries at Lima, Toledo and Cleveland, Ohio. Crude for the Latonia, Ky., refinery is carried up the Ohio to Bromley, Ky.

Complete control of engines and propellers of the "Sohio Cleveland" is directly in the hands of the pilot. Radar scope is shown at left. Ship-to-shore telephone is available beside pilot's seat.

Recent launching of an integrated type barge such as that used in the "Sohio Cleveland" tow. This particular photograph was supplied by Dravo Corp., Pittsburgh, and the barge is not part of the tow being described in this article but does illustrate the integration principle.

PARTIAL LINE COMPLETION INCREASES



Above: Test beds for diesels to drive 200 kw alternators at Harland and Wolff Belfast works.

Below: Worthington-Simpson pumps being assembled for the IPC line, each unit has a capacity of 50,000 barrels daily at 1,000 psi.

OUTLET FOR KIRKUK CRUDE OIL

BEFORE the close of the present month capacity of the Iraq Petroleum Company pipeline from Kirkuk to Tripoli will be increased 50 percent to about 67,000 barrels daily. The increase will mark the partial completion of the first postwar project of the company which, as originally planned, was to increase the outlet of Iraq fields to about 270,000 daily by 1951.

Deliveries of Kirkuk crude would have been increased long since if political disturbances between Arabs and Jews had not intervened. First of the new 16-inch lines from Kirkuk to the Mediterranean seaboard was completed to within 40 miles of Haifa when the hostilities broke out in Palestine, and work was necessarily discontinued. Not only was the increased outlet of Kirkuk oil to world markets delayed, but previous outlet actually was cut in half. The 12-inch southern branch line to Haifa was shut down in the spring of 1948 and has not yet been reopened because of opposition by Iraqi authorities. Previous field production of about 92,000 barrels daily was reduced to about 45,000 barrels, and the Haifa refinery of Consolidated Petroleum Co. was forced to close.

Original plan of Iraq Petroleum Co. had been to complete the laying of the 621-miles, 16-inch line from Kirkuk to Haifa first, and subsequently to undertake construction of the 532-mile line to Tripoli. When the first project was interrupted, the IPC management fortunately was able to use part of the earlier line to tie in with the second. When first laid, the two 12-inch Kirkuk-Mediterranean lines were laid parallel to each other for a distance of about 200 miles from the field to pump station K-3 at Haditha. The new 16-inch lines were following the old route, so it was possible to use the 200-mile segment as part of the Kirkuk-Tripoli line and thus advance the completion date of the northern branch about six months ahead of what would otherwise have been possible.

At the end of March some 219 additional miles of pipe had been laid, and construction was proceeding at the rate of 30 to 40 miles per month. Since that time the line has been completed to Homs at the top of the mountain range in western Syria. By tying the new 16-inch pipe to the old 12-inch line at this point and pumping oil to the highest point in the mountains, the capacity of the final section which runs downgrade will be increased some 50 percent, as previously mentioned. Remaining construction work on the line itself will be completed in the next month or so, but full capacity of about 30,000 barrels daily will not be available until all of the pumping facilities are installed.

Meanwhile, capacity of the Tripoli refinery is being increased to about double its previous capacity. The new figure will be only about 10,000 barrels per day, however, so the bulk of the crude will continue to be shipped to European refineries for fractionation.

Pipe for the Kirkuk-Tripoli line is being received in 35 to 40-foot lengths. After being welded, it is protected against corrosion by coating with bitumen, wrapping with Flexiglass and a final coating of bitumen and asbestos felt. Cathodic protection also is being employed.

Pumping stations for the line are being equipped with horizontal reciprocating units driven by diesel engines. The order for 63 diesels with a capacity of about 60,000 hp was one of the largest ever placed in Britain. The pumps, which are designed and manufactured by Worthington-Simpson, Ltd., are horizontal reciprocating units of the triplex double-acting type, with outside packed, opposed plungers. The plungers are 7¾ inches in diameter with a stroke of 24 inches, and each pump delivers 50,000 barrels per day at a pressure of 1,000 psi. Thirty-six of these pumps are on order from the Iraq Petroleum Co., and the size of each pump may be appreciated by the space occupied, which is 27 by 18 feet, and the weight—54 tons.

Problems of transport alone, apart from other advantages in manufacture, make it essential that the pumps should be an integrated assembly rather than one composite unit. As will be seen from the accompanying photograph, a compact arrangement has also been obtained by positioning the reduction gear within the pump. The power end consists of three separate cast iron frames, each embodying a main bearing and crosshead guide, with one pinion shaft bracket which is bolted to the right-hand and center frames; the three frames are also tied together with heavy cast iron distance pieces. The crankshaft is of forged steel with integral center crank; the two outer cranks which are overhung are steel castings and are shrunk on the ends of the shafts. The connecting rods are also steel forgings, and all bearings are white metal lined with shims provided to take up wear.

The gearing is of the single reduction, double helical type manufactured by Messrs. David Brown. The gear wheel is split and mounted on the crankshaft, while the pinion and shaft are in one piece; both wheel and pinion are made from alloy steel. The pump ends are made from solid forged steel blocks, all chambers and passages being machined out. All corners are radiused, and special apparatus was developed to remove sharp edges in order to eliminate stress raisers.

The valves and seats are stainless steel forgings, heat-treated after machining, then finally ground. The valve cover plugs, which are of mild steel, make a metal-to-metal joint with the body, thus avoiding the necessity for joints and the attendant risk of joint failure. The plungers are of special cast iron mixture to give a tough, durable skin with high surface finish. Of particular interest is the form of the plunger gland which differs from the conventional studded type. This gland, which is screwed externally with a fine thread, screws into a corresponding ring attached firmly to the stuffing box, so that the packing is always compressed evenly.

Suction and delivery manifolds interconnecting the respective pump ends are made from solid drawn steel tubes. A four-inch by-pass valve is fitted between suction and delivery manifolds to permit starting up under no load, and a five-inch relief valve is also provided, capable of passing the full capacity of the pump. Suction air vessels are fitted to each valve box, and an alleviator is attached to one end of the delivery manifold to iron out pulsations in flow.

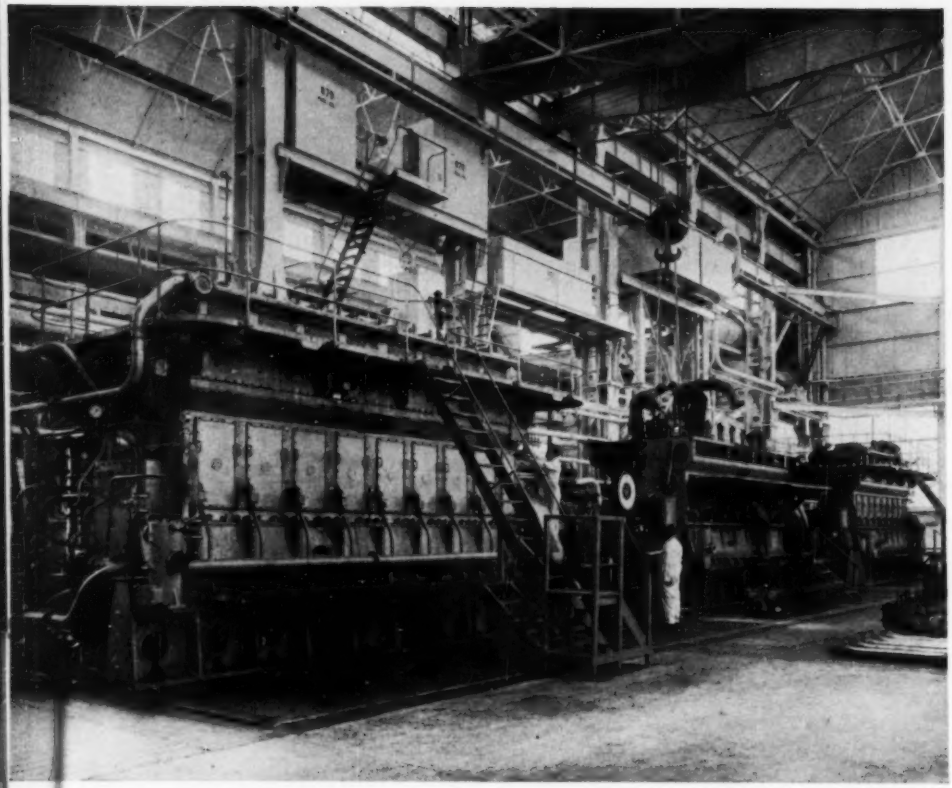
The whole pump is totally enclosed, these enclosures being dust-tight in view of the sandstorms encountered at site. A breathing system is provided with air filters and non-return valves so that a continuous scavenging can be maintained in the enclosed spaces to prevent any build-up of inflammable vapor from gland leakage.

The lubricating supply is provided by a helical gear pump driven through spiral gearing from the main pump pinion shaft. The pump delivers oil from the drain tank through a pressure filter to the "bus" pipe, and off this pipe are taken leads to the various bearings. Restriction orifices are fitted to ensure proportionate distribution to all parts, all these orifices being such as to maintain the pressure in the "bus" pipe in the neighborhood of 20 pounds per square inch.

As a visible check on the flow of oil, indicators are fitted in the leads to each bearing, and thermometers are also permanently provided at these points. In addition, there is an electrical alarm which, working on an excessive drop in the oil pressure, operates a Klaxon horn and, simultaneously, a red lamp in the engineer's office to indicate the particular pump in which a failure of the oil supply is imminent.

Motive power for the pump is provided by a Harland and Wolff airless injection oil engine developing about 950 bhp at 300 rpm when derated for service conditions of altitude and ambient temperature. The engine is coupled to the pump pinion shaft through a flexible coupling, and an intermediate shaft which passes through the fire wall.

It was considered imperative that the pumping unit should be thoroughly tested under condi-



Testing three of the 1,250 hp. diesel engines built for the Iraq Petroleum Co. pipe line from Kirkuk to Tripoli.

tions as closely similar to site as possible, and to this end a duplicate of the external manifolding and piping system was installed at the works of Worthington-Simpson, Ltd. Thus it was possible, within the limits of similarity, to prove the piping layout, a precaution in which engineers will concur, it being well known that the associated piping can have considerable influence on the smooth operation of the pump.

In 1934 Harland and Wolff completed the delivery of 15 engines having a normal output of 500 bhp each for the Iraq Petroleum Co.'s first pipelines between Iraq and the Mediterranean. These engines were required to conform to certain requirements peculiar to this service. For example, the valve gear was totally enclosed so as to be proof against the ingress of grit during sandstorms. The water circulation system ultimately parts with its heat in heat exchangers cooled by the oil in the pipeline. The engines are required to operate continuously day and night for long periods, making use of crude oil as fuel. This necessitates special arrangements in connection with the injection equipment.

These engines have now been operating for 14 years, each engine working over 6,000 hours per year, so the new units ordered from the same manufacturer are considered of proven design.

The extensive current enlargement of the pipeline system requires a number of larger engines for pumping as well as smaller engines for auxiliary purposes. The pumping engines included in the order are 36 in number, arranged four in a station. The auxiliary engines are used for driving alternator house sets. There are 27 of these, arranged three in each of nine stations, as well as ten similar sets for terminal refinery service.

The pumping engines are of the H&W four-stroke type, developing on site approximately 950 bhp at 300 rpm after the necessary derating for temperature and altitude. The equivalent power for a shop test at sea level is about 1,250 bhp. These engines are of the four-stroke type with pressure induction by means of electrically-driven blowers supplied by Keith Blackman Ltd. The air pressure is about three psi.

The bore and stroke, 400 by 600, is one of the maker's standard sizes for which a large number of orders have been received for service at home and abroad. The pistons are oil-cooled with separate visible outlets and discharging outside the crankcase so that the piston cooling oil is not exposed in the crankcase and only mixes with the lubricating oil in the comparatively quiescent space of the lubricating oil drain tank. The valve gear is once again totally enclosed so as to be sand tight, this indeed being a necessary precaution for desert operation.

The fuel injection equipment comprises scroll plunger control. The fuel valves are provided with lapped spindles with flat seats and a patented blast chamber device for minimizing carbon formations on the fuel valve nozzles.

The forced lubricating oil pumps for lubrication and piston cooling are directly driven from the free end of the engine by means of an alignment coupling and deliver through vertical, multitubular oil coolers with by-passes for the control of oil temperature. These coolers have removable stacks and will be arranged to facilitate overhauling and cleaning. The lubricating oil system is primed by means of an electrically-driven pump attached to each engine. This not only obviates the drudgery of hand priming in a hot climate but ensures that the priming is thoroughly effective to an extent which is not possible with hand priming.

The air and exhaust valve spindles are provided with stellited top faces, engaging with cam-like inserts of hardened steel at the ends of the drop forged steel levers. The levers are supported by grease lubricated, needle bearing fulcrum pins so that the engine tops are of the dry type. For piston cooling each outlet is visible and provided with a thermometer pocket, so that the accuracy of distribution is easily observed in service.

The pistons are provided with fully floating gudgeon pins with provision for generous lubrication of the piston bosses. These are provided with ample drains which ensure a steady flow of lubricating oil through the top ends and the gudgeon pins, thereby maintaining them at an exceptionally low temperature. The cylinder liners of pearlitic cast iron are finished by fine boring and are not gashed to clear the valve heads. This undesirable feature is rendered unnecessary by locating the valve pockets in the recessed cylinder covers, which have an additional advantage in greater freedom for expansion.

The engine frames are monobloc castings in two sections, bolted together at the center of the engine and fitted with adjustable and removable semi-circular seated camshaft bearings. Ample access doors are provided, one back and one front, for the inspection and adjustment of each connecting rod. These inspection doors are sufficient for the removal of a piston through the crankcase, if this is desired. The bedplates are also of cast iron and are of the dry sump type with a gradual slope to the aft end, at which a drain pipe conveys the lubricating oil to an ample drain tank outside the engine.

The crankshaft is of the semi-built type having integral cast steel crankpins and crankwebs shrunk on to forged steel journal pieces.

Auxiliary engines are of the four-stroke type with normal induction and having five cylinders 316 diameter by 380 stroke. The site output is 200 kw at 428 rpm. With these smaller engines also, sand-proof enclosure of valve gear has been carried out, and the same general types of fuel pump and fuel valve are used for dealing with the crude oil on which they will run. The design of piston and connecting rod is generally similar to that of the larger sets, but piston cooling with lubricating oil is not necessary with these smaller sizes.

OIL DEVELOPMENT IN CHILE

By Dr. J. E. Rassmuss

THE Chilean government, through its Corporación de Fomento de la Producción, has succeeded in a period of a few years in creating the basis of an important oil industry, which in the near future may make the country independent, at least to a considerable extent, of petroleum imports and save a substantial amount of foreign exchange in the balance of payments. Petroleum imports in 1947 represented a value of about $26,000,000 or almost 10 percent of the total imports of the country.

By the law No. 4281 prohibiting the granting of concessions to foreign companies and law No. 4927 which reserved refining to the government, a virtual monopoly has been established. The Corporación de Fomento de la Producción, which is a government agency for promoting and financing new industries, was authorized by the decrees of 1943 and 1946 to undertake, through its Department of Energia and Combustibles, the exploration and development of prospective oil fields in Magellanes in the southernmost part of Chile. Detailed geological and geophysical research work was put in charge of the United Geophysical Co. and its affiliated firm of Hoover, Curtice and Ruby. Existence of a sedimentary series of Tertiary and Cretaceous beds of tremendous thickness was established by these investigations.

Seven wells had been drilled in the years from 1930 to 1936 to depths varying from 2,000 to 5,700 feet in the Brunswick Peninsula, but only one of them had attained the Cretaceous, the other terminating in the Tertiary beds. Isolated oil and gas shows but no commercial production had been obtained. Kotary equipment, consisting at present of three rigs, was then acquired, and drilling was undertaken by the Livermore Corporation of Lubbock, Texas. Three wells drilled with cable tools on the continent proved unsuccessful, but the first rotary well in Cerro Manantiales (Spring Hill) on the Isla Grande de Tierra de Fuego, east of Punta Arenas and the Magellan Straits, found oil in December 1945 at a depth of 2,243 meters, about 7,500 feet, in the so-called Springhill Sand. Three structures have been located in Tierra del Fuego, namely on Cerro Manantiales, Espora to the north, and San Sebastian, 80 kilometers to the south. Twenty wells have been drilled so far in the central field of Cerro Manantiales, of which 18 are completed. Two, numbers 19 and 20 are still drilling. Of those wells, Nos. 1, 7, 8, 9, 10, 11, 12, 13, 16, 17 and 18 found oil at an average depth of 7,500 feet with a pay strike in Upper Cretaceous, underlain by ash beds of possible Triassic age, which may correspond to similar beds in the Comodoro Rivadavia field in Argentina. Wells, No. 3, 5, 6, 11, 14 and 15 produced gas, and No. 2 and 4 remained dry. The thickness of the producing sand varies from 30 to 100 feet; the porosity is of 20 to 25 percent. Yields were tested only for short periods, as no storage facilities existed when the wells were brought in. The initial flow is estimated at about 750 to 1,000 barrels per well. Bottom hole pressure is about 3,500 pounds, and the pressure in the casinghead about 1,500 pounds. Gas oil ratio varies from 1,500 to 7,000 cf. per barrel. The grade of the oil, which is of paraffinic base is 39° to 42° API. Sulfur content is very low, about 0.05 percent; pour point 65°F.

On the Espora structure, which is about 100 meters higher, 10 kilometers father north, well No. 1 went to water, but as the beds are rising to the west, a second well has been located about 900 meters distant and is expected to find oil. The depth is about 2,200 meters.

At San Sebastian, some 80 kilometers to the south, further drilling has been postponed because of the low permeability of the sands. But the Argentina government company, YPF, is drilling an exploratory well in Rio Chiro, southeast of Bahia San Sebastia, east of the border between the two countries.

A pipeline of eight-inch diameter will be laid from the Manantiales field to Caleta Clarencia, a distance of 65 kilometers. Pipe for the line is now being shipped. In the bay of Caleta Clarencia to the northeast of Punta Arenas, the depth of the harbor of more than 40 feet permits the entrance of tankers of every size. Acquisition of a first tanker of 9,000 deadweight tons has been approved.

Commercial production is expected to begin in the year of 1950 with 2-3000 barrels daily, expecting a future yield of 10,000 to 12,000 barrels daily. Reserves are calculated at some 30,000,000 barrels.

The marketing area of Chile is composed of two sections, and market requirements differ widely. The normal consumption of the center and south of the country of gasoline, kerosene, diesel oil, lubes and paraffine amounts to about 7,500 barrels daily at present, and is estimated for 1950 at about 10,000 barrels, an increase of some nine percent. On the other hand, the big North American mining companies in the north and the nitrate fields have a very high consumption of fuel oil, amounting to 6,000 to 800,000 tons yearly, which is imported directly by the companies themselves on a special freight rate. The normal consumption of the rest of the country, especially in white products but including also fuel oil for the smaller national industries, is expected to be supplied in the future from the fields in the south, making the country independent of imports with the exception of fuel oil for the north. The Corporación has, therefore, considered the construction of a refinery of 12,000 barrels capacity, north of Valparaiso, the most important port near the capital of Santiago. Crude will be transported there by government tankers from the south. Plans for the refinery have been postponed until the end of the year.

The import and distribution of petroleum products is handled at present almost entirely by three companies: the Compañia Nacional de Petróleos de Chile (Copec), the Esso Standard Oil Chile, and the Shell Mex Chile, in more or less equal parts, raising to 50 percent for gasoline for Copec. Each of the companies has its own disembarking, storage and distribution facilities, such as tank cars, trucks and filling stations.

Development of the southern fields, which has required an expenditure up to the present time of roundly 300,000,000 pesos ($10,000,000), will enable Chile to provide a substantial part of its consumption, and the refinery is proposed to process the output of Chile's own fields. It is not planned thus far to supply the large quantities of fuel oil required by the mining industry in the north, since this would result in a substantial surplus of white products, surpassing the needs of the country.

Some speculation has arisen regarding other possible sources of energy in the north, so the heat of natural vapors in the subsoil, in the region of Tatio in the province of Antafogasta, as a source of energy for a power plant such as exists in Ladarello, Italy. Oil seepages are known also in the Puna de Atacama in the north, proceeding probably from overlapping remnants of the oil-bearing formations of northern Argentina. But the possibilities of the existence of commercial oil in the north and of isolated indications in other parts of the country, such as Arauco, Bio Bio and Llanquihue, have not yet been fully investigated and cannot be taken into account as of present importance.

Condensate from TCC tower being sprayed into the air for elimination of ammonia or hydrogen sulfide.

NATIVE FISH HELP TEST ASHLAND REFINERY WATER DISPOSAL SYSTEM

By James A. Wallen

COMMENDED by Kentucky's Department of Game and Fish for the relative purity of the effluent waters from its two refineries located on the Big Sandy River, Ashland Oil & Refining Co., Ashland, Ky., has developed an extensive and successful water cleansing system. The plant involves separators for removing oil from waste waters and a series of pools and sprays for aeration. A Kentucky conservation officer was so impressed that he had a series of large photographs of it included in his department's exhibit at the Kentucky State Fair in Louisville last fall. These photographs depict the various stages through which the refinery waste waters move as they go through the cleansing process.

Filter constituting final step in water clarification and treatment at No. 1 plant.

To make certain that the cleansing system is accomplishing its purpose, Ashland Oil & Refining Company maintains a constant watch on the river surface for any signs of oil films and makes daily tests of river water samples. A good indication that the effluent waters are not harmful to fish life in the stream is given by observation of native fish, kept in cages suspended in the river below each of the refinery waste water outlets and also at a point above the refinery, where there is no possibility of contact with the effluent waters. In one of the cages, suspended from a float immediately below the flow of waste water from one of the plants, a catfish lived for 75 days, which is the longest any of the caged fish has ever lived, whether above or below the refinery effluent outlet. Life of any fish is naturally limited when it is kept inside a cage. Native fish, such as catfish and sunfish, taken from the stream at a nearby point, are used for this purpose.

A refinery employee gathers river water samples daily for analysis in the refinery laboratory and keeps a regular check on river conditions. He watches the surface of the water for any oil film and makes a detailed monthly report to the refinery superintendent.

Ashland Oil's two plants are several miles above the point where the Big Sandy flows into the Ohio, and there are frequent changes in river conditions which must be noted. During much of the summer the waters of the Big Sandy at this point form a virtual pool with little or no current, the water being kept at a steady level by the dam at the mouth of the river. At times there is a slow current, and on occasions the stream becomes almost a rushing torrent after prolonged heavy rains in its mountainous headwater area.

Any film of oil which might appear, is of course, almost invisible when the river water is muddy and is quickly carried away by swift current. Any caustic or oil when the river is at low stage and without much current would appear at once.

There are basins at both the upper and lower outfalls of plant water, and as the effluent goes into these basins, samples are taken for analysis. Other samples are also taken just downstream from the two outlets and more than a mile farther down the river, at a point just above the intake of the Catlettsburg municipal water system. The Catlettsburg samples are examined carefully to make certain the river flow is in proper condition to be processed and put into the city water supply. The refinery laboratory staff also makes a taste test and tests for the presence of caustic.

The mechanical separators, which remove the surface oil before the water starts on its way to the oxidation pools, return the recovered oil to the plant. There are two separators, one at each plant, which are somewhat different in operation. At the No. 1 refinery the separator comprises a number of baffles through which the water moves slowly, while the floating oil is drawn off through funnels and pumped to separating tanks. From time to time large paddles are used to keep the heavier concentrations of oil moving toward the funnel mouths. At the No. 2 plant the separator is a deep concrete structure with the liquid flowing through the bottom. A series of chain-operated paddles, powered by electric motors, keeps the floating oil moving toward

the skimmer which draws off the oily scum and carries it away.

These separators are just the beginning of the process which makes certain that all water flowing from the refinereis into the nearby Big Sandy River is sufficiently pure to be made into a potable and sanitary water supply by the usual means.

A half-mile series of shallow pools have been constructed at the No. 2 plant, from which a clear stream of water eventually flows into the Big Sandy. Before going into these pools, condensate from the TCC unit is forced up into the air in a fine spray to eliminate the hydrogen sulfide before the water falls down into the larger body of water. There is a second spray at the head of the 25,000,000-gallon reservoir which constitutes the first in the series of pools. The water in these pools moves very slowly, allowing maximum time for oxidation. When it finally reaches a point near the Big Sandy, it is held back by a specifically designed concrete dam, around the top of which is a steel skimming rim to hold back any residual oil which may still be on the surface of the water. A pump picks up surface water behind the rim and returns it to the head of the pools, to be sprayed into the air and begin again its slow movement down toward the dam.

The cleaner water, which has been allowed to flow under the skimming rim, goes over the dam in an extremely shallow stream, providing a considerable amount of aeration. From here on into the Big Sandy it becomes a clear stream, flowing rapidly over a rocky bottom and between banks which are covered with flourishing vegetation.

At the No. 1 refinery water coming from the separator goes through a filter just before it is allowed to drain into the Big Sandy.

On the grounds of the No. 2 plant there is a large, shallow pit, with a network of ai pipes on the bottom. Whenever there is any waste caustic from the plant, it is drained into this pit for neutralization and is aerated by jets from the underlying pipes.

Outflow of clear treated water from No. 2 plant. The water encourages brookside vegetation and does not affect fish life, as is continuously proven by nature fish in the trap at the outlet. →

At the No. 1 refinery laboratory the samples are tested for chemical contamination, while at the laboratory of the No. 2 refinery they are treated with calcium hydroxide, alum and zonite to make them potable and are then subjected to a taste test by one of the laboratory technicians.

Such precautions as these will probably become general among manufacturing plants having drainage into streams of the Ohio watershed, as the eight-state water sanitation commission advances with its work of abating pollution of the rivers. The commission was formed in June 1948, with three representatives from each state, immediately after the signing of the Ohio Valley Water Sanitation Compact at Cincinnati. Signatories to the pact were the governors of Indiana, West Virginia, Ohio, New York, Illinois, Kentucky, Pennsylvania and Virginia.

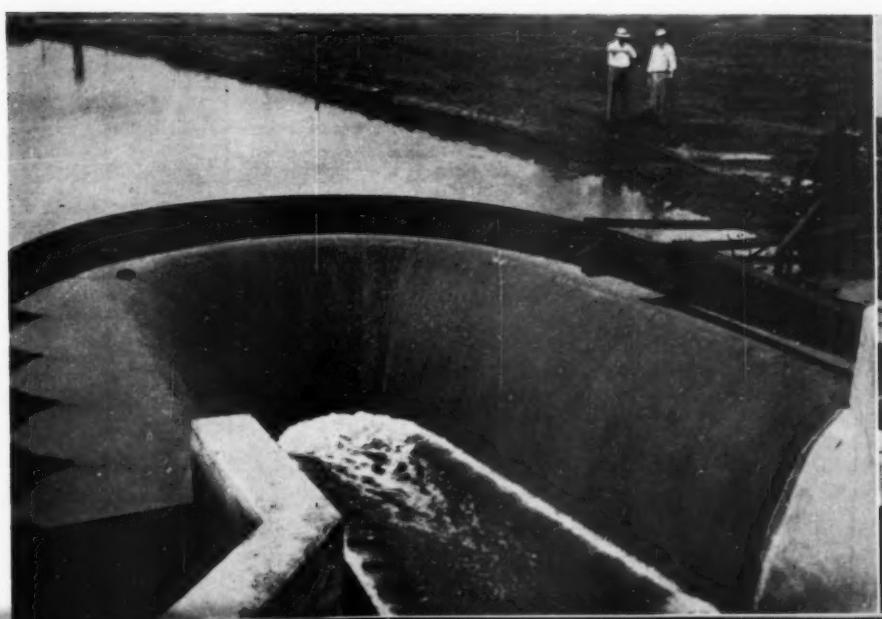
Interested in the maintenance of a safe water supply for the industries and population of the valley, as well as in the preservation of fish and wild life, the water sanitation commission, which recently established its central office in Cincinnati, pointed out that more than 6,200,000 persons are supplied with water from the Ohio River and its tributaries, with one and a half million of these using water from the Ohio itself.

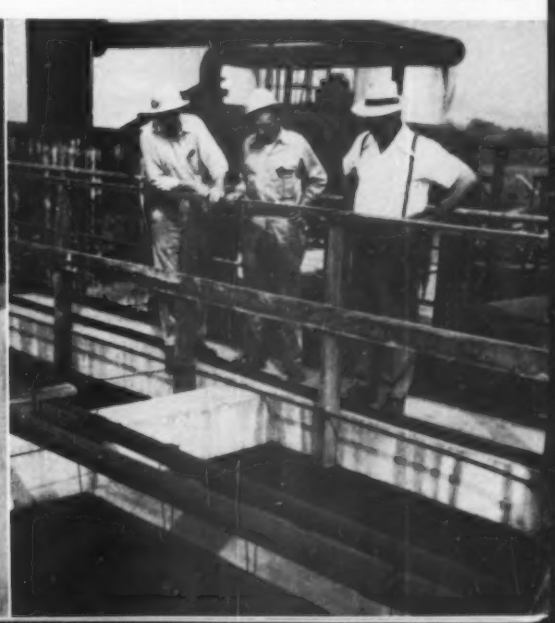
Its plans involve construction of modern municipal sewage disposal plants as well as means for batement of industrial pollution, and it has been estimated that the planning and building stage will require a decade and involve the expenditure of many millions of dollars. However, those who have become inteersted in the work feel that its objective of achieving stream sanitation is a necessity if the valley is to realize its best possibilities for continued development.

Laboratory technician Frances Pogue who makes the taste test of treated water in addition to tests for color and caustic or other contaminants.

Concrete separator at No. 2 plant being inspected by Supt. Roland Wheely, operator Joe Caudill and J. A. Gauze of the Kentucky Department of Game and Fish.

Concrete dam and steel skimming rim to catch any final surface oil which may have escaped. This surface water is pumped back to the first pool for reprocessing.





ECONOMICS OF VENEZUELAN OIL INDUSTRY

Since Crude Petroleum is Now Entering A Buyers' Market the Lowest Cost Oils Will Have a Sales Advantage. If Venezuela is to Continue to Grow as a World Oil Supplier Recent Cost Trends Must Be Reversed.

A STUDY of the economy of Venezuela with recommendations as to how the prosperity of its people may be placed on a broader and firmer base has been published by Joseph E. Pogue, vice president of The Chase National Bank, New York. The study, which is titled "Oil in Venezuela," originally was presented as an address before the College of Engineers of the Venezuelan Association of Geology, Minerals and Petroleum.

With nine billion barrels of known reserves of petroleum equal to 11.4 percent of the known reserves of the world, the future of oil supplies in Venezuela is good, if costs do not go too high in relation to other nations, Dr. Pogue says. But the nation is peculiarly vulnerable from an economic standpoint because it depends so much on oil for the world's goods which it must import. In 1948, for example, Venezuelan oil exports were valued at $1,079 million, and all other exports, $49 million. This means, of course, that Venezuela's prosperity now depends overwhelmingly on the state of the world's oil markets. "The country, therefore, is faced with the need for investing prudently a portion of her current export proceeds in developing the most promising alternate resources and industries," he writes.

Examining the nation's potentials aside from oil, Dr. Pogue suggests that "the greatest future of the country undoubtedly lies in the further development of its natural resources." Great mineral wealth is available in the Guayana highlands and the rolling Llanos provide agricultural and pastoral resources which are not well developed. These potentials can be exploited effectively if the oil industry is kept in a healthy condition and if the capital it generates is reinvested in these other enterprises and not dissipated in the purchase of imported consumer goods. Currently imports are subject to high tariffs and substantial mark-ups, creating inflated prices. Commercial profits of a few are high, but these are being invested largely in real estate so that land values are rising. "Thus the great wealth created by the mass production of oil, while largely remaining in the country, becomes overly channeled into inflationary effects which have no economic utility, to the detriment of its wider diffusion into raising the living standards of the many."

Income of Venezuelan government from oil industry compared with that from other sources, 1943-1948.

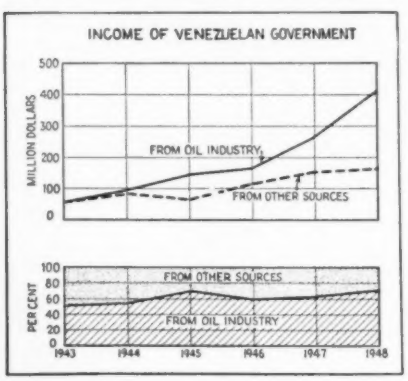


TABLE I

Position of Venezuelan Oil in World Markets
(In Thousands of Barrels Per Day)

	1947 Actual	1948 Actual	1949 Estimated
World Demand	8,740	9,305	9,600
World Supply—			
United States	5,452	5,907	5,675
Middle East	838	1,136	1,300
Canada	21	33	50
Others (Excl. Ven.)	1,204	1,361	1,400
	7,515	8,437	8,450
Venezuela	1,191	1,339	1,175
Total Supply	8,706	9,776	9,600
Change in Stocks	—34	+471	0

A detailed review of the economics of the oil industry in Venezuela is given in which the author points out that, since nearly 99 percent of the petroleum is exported, it is essential today to consider the customer. "A buyers' market has supervened, and the evidence is quite convincing that for a long time to come the various sources of supply will be competing with one another for available customers, growing though overall requirements may be. Conditions are rapidly developing under which no single oil-exporting nation can hold a preferred position, or even an indispensable place, in the international oil trade."

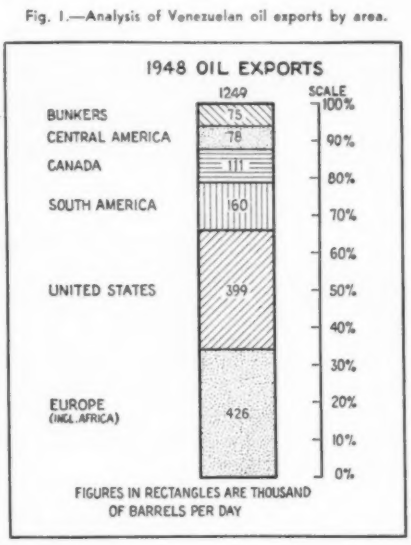
In 1948, as indicated in Fig. 1, 66 percent of Venezuela's oil went to the United States and Europe, about half to each. To both of these areas Venezuela has a good freight advantage when compared with the Middle East. This advantage will drop materially when the pipelines across Arabia are completed. Cost of laying down oil at United Kingdom ports currently is 50 cents per barrel from Venezuela, 42 cents from Haifa and $1.04 from Ras Tanura. "Despite its transportation advantage, however, Venezuelan crude is being displaced in European markets by Middle Eastern crude, and there is every indication that this trend will continue. The reason is clear. Low producing costs in the Middle East more than offset the differential," Dr. Pogue states.

The freight advantage accruing to Venezuela is much greater in the United States and Canada when compared with the Middle East. "Accordingly, Venezuela can compete with Middle Eastern crudes in the western hemisphere provided producing costs in Venezuela in comparison with those in the Middle East can be held down to a differential smaller than the transportation difference. Such a level, however, will call for a prompt reversal of recent cost trends in Venezuela."

The current position of Venezuela in world markets is shown in Table I. In presenting the tabulation Dr. Pogue did not attempt to forecast the future because "the future position of Venezuela . . . will depend on the interplay of so many factors." He did point out that the competition is not alone for markets but also for exploration effort on the part of oil venture capital.

To illustrate the recent trend of oil operating costs in Venezuela, Dr. Pogue presents a tabulation giving the costs of 12 Venezuelan oil companies for the past six years. In this period net expenses were lowest at 72 cents per barrel of

Fig. 1.—Analysis of Venezuelan oil exports by area.



oil produced in 1944. In 1948 the expense item had more than doubled, standing at $1.54 per barrel. Average for the six years was $1.06. A considerable part of the increase in cost was in taxes, which rose from 31 cents per barrel in 1943 to 86 cents in 1948.

The current Venezuelan theory of oil taxation is that the oil companies and the government shall share profits equally. Actually, however, in the past six years taxes have averaged 55 cents per barrel and net income 47 cents per barrel. The government thus has taken 54 percent of the net income and the oil companies 46 percent.

In discussing the 50-50 theory, Dr. Pogue points out that this ignores the fact that a going business must reinvest a very large part of its net income in order to stay in business. It must not pay out all its net income as dividends. In Venezuela in the past six years 12 Venezuelan oil companies have made a net of 47 cents per barrel, but they have reinvested 25 cents of this and paid out only 22 cents per barrel in dividends to stockholders. Actually, therefore, the ratio of taxes to dividends paid has been 72 percent to the government and 28 percent to the oil investor.

During the past six years 12 Venezuelan oil companies have paid taxes aggregating $1,131 million and dividends totaling $444 million. They have reinvested from earnings $527 million to find and produce more oil. Dr. Pogue suggests in his paper that the evolution of '50-50' has not only acted as a disincentive to capital, but in effect has gone to the extreme of constituting a tax on capital expenditures."

Result of the tax policies of the Venezuelan government has been to cause the oil industry to pay a very large share of the cost of the State. In the past six years oil has created 64 percent of the government's revenue. In 1943 oil was producing half of the tax revenue, and in 1948 this had risen to 72 percent.

In concluding his paper Dr. Pogue suggests that Venezuela should set in motion forces making for fundamental improvements in the economy. "The two prime objectives are: to keep Venezuelan oil competitive in world markets and to promote the transfer of the economic energy of oil to the whole economy. The first objective calls for restraint, even reversal, in taxation and other measures having the effect of raising operating and investment costs. The second objective requires measures designed to lower the cost of living and to stimulate domestic food production. These ends may be promoted by the direction of government expenditures more fully into roads, agricultural schools, ports and waterways; by the stimulation of farm mechanization and facilities for the distribution of farm products; and by reduction in tariffs, simplification of trade procedures, taxation of idle lands to bring them into use, elimination of monopolistic practices in pricing, and the advancement of competition in fields where profit margins are highest. Furthermore, by giving confidence to capital through its treatment of existing industries, the State can point the way to the development of that vast unexplored area south of the Orinoco River whose geologic complexion is so similar to the Precambrian Shield of Canada as to suggest the presence of comparable mineral wealth.

PEMEX ANTICIPATES 1949 OPERATING DEFICIT
BERMUDEZ TELLS STRIKING OIL WORKERS

Mexico City

FOUR principal leaders of the oil workers union in Mexico have been driven from their positions by angry union men in recent weeks. The union membership was greatly displeased when the "big four" of the union's national executive committee accepted a settlement of their demands at a level far below that which the workers had hoped to achieve. The unions had asked for an increase in wages aggregating 3,500 million pesos, which Senator Antonio J. Bermudez, director general of Pemex, remarked was more than this year's budget of the Mexican government and Pemex put together. It was reported that the unions actually hoped to get a raise totaling 132 million pesos. The award approved by the government and the union heads was 33 million pesos.

Hardly had the announcement been made when violence began with the arrival at Tampico of Eulalio N. Ibañez, union secretary general, and Pedro Duran Z., also a Federation of Latin American Workers officer, who sought to appease the largest of the union's locals, composed of Tampico and adjoining Ciudad Madero workers. While Ibañez and Duran Z. were en route from Mexico City, the Northern Zone men held a night meeting in the Tampico bullfight ring, which was attended by representatives of the Mexico City Locals 34 and 35. Speakers at the meeting declared the national executive committee had no authority to make the settlement and branded its members traitors. Next morning Northern Zone leaders held an emergency meeting at which it was decided to oust the "big four" and to move for an emergency national convention of oil workers to decide whether or not to accept the pact.

Ibañez and Duran were doused with crude oil and beaten up and their handsome car almost wrecked by Local 21 (Arbol Grande) workers. Poza Rica workers (Local 30) cheered speakers at their mass meeting who opposed the pact and booed those who favored it, but were otherwise orderly.

Bloody violence began at a Local No. 1 mass meeting in a theatre in Ciudad Madero. Gunmen rose in the audience and ordered the chairman to get out. In the fight which ensued, more than 20 shots were fired, it was said. Two workmen were killed and others wounded, one of whom died next day. Two workmen were stabbed to death in street quarrels. All union leaders fled. Troops took charge, and the police sought the leaders and gunmen. Six men were arrested. Two thousand attended the funerals of the dead. A new executive committee of Local No. 1 was appointed.

Bodies of two oil workers were found murdered at Ciudad Madero—one in the refinery, the other on the railroad tracks. Extra troops have been assigned patrols there. Jesus Chiñas Coron and José Luis Andrade, also of the "big four" were hooted into flight when they tried to attend a mass meeting of Mexico City oil workers. Chiñas was arrested but released in bail for allegedly slapping an attacker with his gun. On June 13 the union's national vigilance committee formally advised Labor Secretary Ramirez Vasquez that Ibañez, Chiñas, Duran and Andrade had been officially supplanted by Ricardo Gonzalez, Angel Cristo, Francisco Mayagoitia and Nicanor Davila. Union headquarters have become a veritable fortress, say the new chiefs, to keep out at all costs Chiñas, who proclaimed he will hold office by force. Ibañez is in Tampico. Duran and Andrade have disappeared.

The ousted "big four" in a full-page advertisement in El Popular, a leftist Mexico City daily, called the case "a plot against labor and peasant unity," urged oil and other workers and peasants not to be fooled by malcontents who seek to make the pact an excuse for getting control on the pretext that the settlement violated the right to strike of Mexican workers.

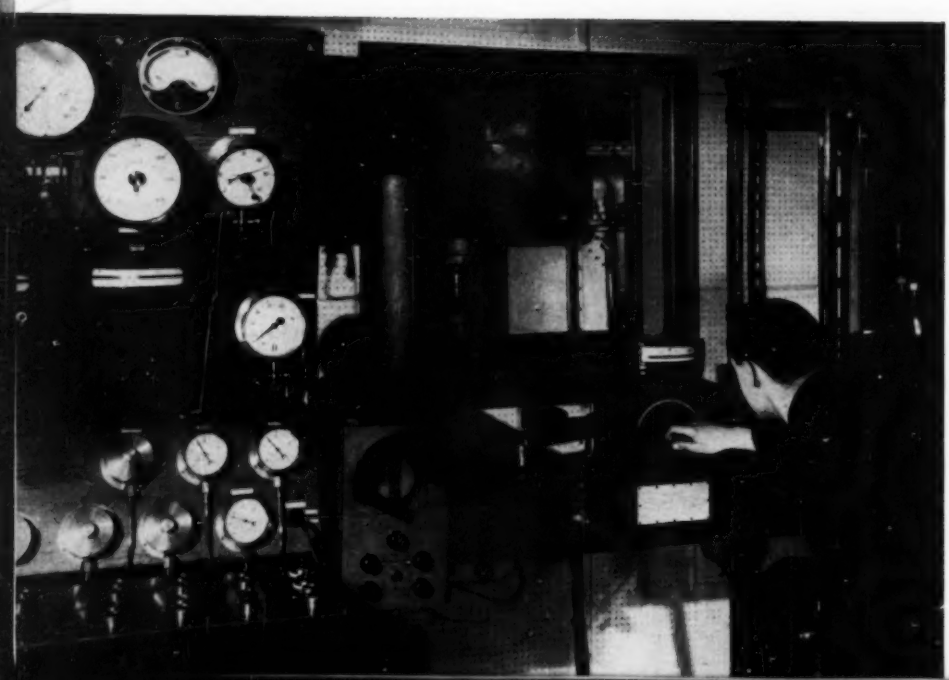
Pemez, in a written statement to the Federal Board of Conciliation and Arbitration, declared that it was impossible for it to meet their 3,500-million-peso demand because it would have a deficit this year of some 193 million pesos. That was Pemex's first admission of a deficit. Its various chiefs had always stoutly maintained that Pemex was keeping in the black.

Bermudez, denying published reports in Mexico City that he will soon resign, asserted that he has no intention of resigning. That declaration was seconded by the Ministry of the Interior, chief government department, which branded the report "totally false."

Anglo-Iranian Oil Co. research station, Sunbury-on-Thames.

RESEARCH ORGANIZATIONS OF THE BRITISH OIL COMPANIES

by E. Lawson Lomax



THE oil industry in general is a good example of the value of well-directed research in all branches of its activities, starting from the location of oil deposits, right through the whole gamut to the modern manufacture of chemicals from crude petroleum.

The British oil industry has played a great part in oil development through the research organizations established by the various companies. In the early days of the industry its research consciousness was not at all highly developed, and very few companies, if any, considered a separate research organization necessary for future success. The writer remembers in his early days in the industry being questioned by his refinery superintendent about his academic qualifications and finally having the following said to him: "If I had had the opportunity to go to a university and at the end of my course I had graduated with

← Control room of aero-engine lubricating oil test unit at Anglo-Iranian research center.

honors, you would not find me wasting my time in an oil refinery."

How very different is the outlook today, when in proportion to the whole of its employees, the industry probably employs a greater percentage of graduates than any other single industry; and of these graduates, to say nothing of other employees of all grades, a higher proportion is engaged solely on research. This research consciousness is to a great extent responsible for the vast strides the industry has made in every conceivable way during the past three decades.

It is not the purpose of this article to stress the value of research or the part it has played in the development of the industry, but rather to give short accounts of the various research activities of the companies.

Currently the petroleum refining and chemical industry in Britain is comparatively small, but with its projected refinery development to 20 million tons per year, it will readily be seen how necessary intensive research will be.

The Anglo-Iranian research laboratories at Sunbury were set up in 1917 at an old house called Meadhurst, in the parish of Ashford, Middlesex, and from these small beginnings an organization has developed which at the present time employs about 320 fully qualified technical staff and about 380 non-technical and clerical staff, tradesmen and assistants. The old house no longer exists, but its grounds together with land subsequently acquired are covered with what amounts to a well-laid-out factory, with specially designed buildings to house efficiently the various activities of a research station, where many of the processes connected with the organization and running of the world's largest refinery at Abadan are conceived, worked out and developed to large plant scale.

The problems connected with the refining of Persian crude oil have been many, and of various kinds and difficulties; and while many of the major ones have been successfully solved at Sunbury, yet the expansion and development of the petroleum industry during the last two decades has been so rapid that it has inevitably generated new problems and difficulties which Sunbury is tackling in its stride and for which purpose it is excellently equipped.

In an installation of this kind the question of organization and collaboration is fundamental, avoiding any duplication of activities and yet insuring complete coordination between the various sections, thus leading to maximum efficiency being obtained from the efforts of the large and competent staff employed. The activities of this research department can be roughly divided under various sections, each working under the head of the station, as follows: chemical research, physics research, engine research, development and analytical research. Each of these sections is divided into groups, which are organized functionally, and there is an elaborate cross section between them. Common to all sections are the administrative section, technical records, machine and mechanics' shops, glass blowing, photography and welfare which service the whole organization. Special attention has been paid at Sunbury to these latter sections, and of great interest are the machine and mechanics' shops and the glass-blowing department, where all machines and apparatus, except those of makers' design, can be fabricated on site and where plant and instruments for special purposes can be designed and fabricated as well as repairs and alterations to existing plant made.

The chemical and physical laboratories, which are very extensive and well-manned, are equipped with every conceivable type of apparatus which can be imagined for use in the work in hand. A full set of gas analysis apparatus enables complete analytical data to be obtained on all types of petroleum gases; it also includes equipment for distillation, cracking and for infra-red and ultra-violet spectrographic work, while in the general laboratories a wide range of organic and inorganic analyses can be carried out.

A special section deals with standard methods of analysis of petroleum and its products. This laboratory, along with the laboratories of other oil companies, has played an important part in the development of the standard work on the subject published by the Institute of Petroleum.

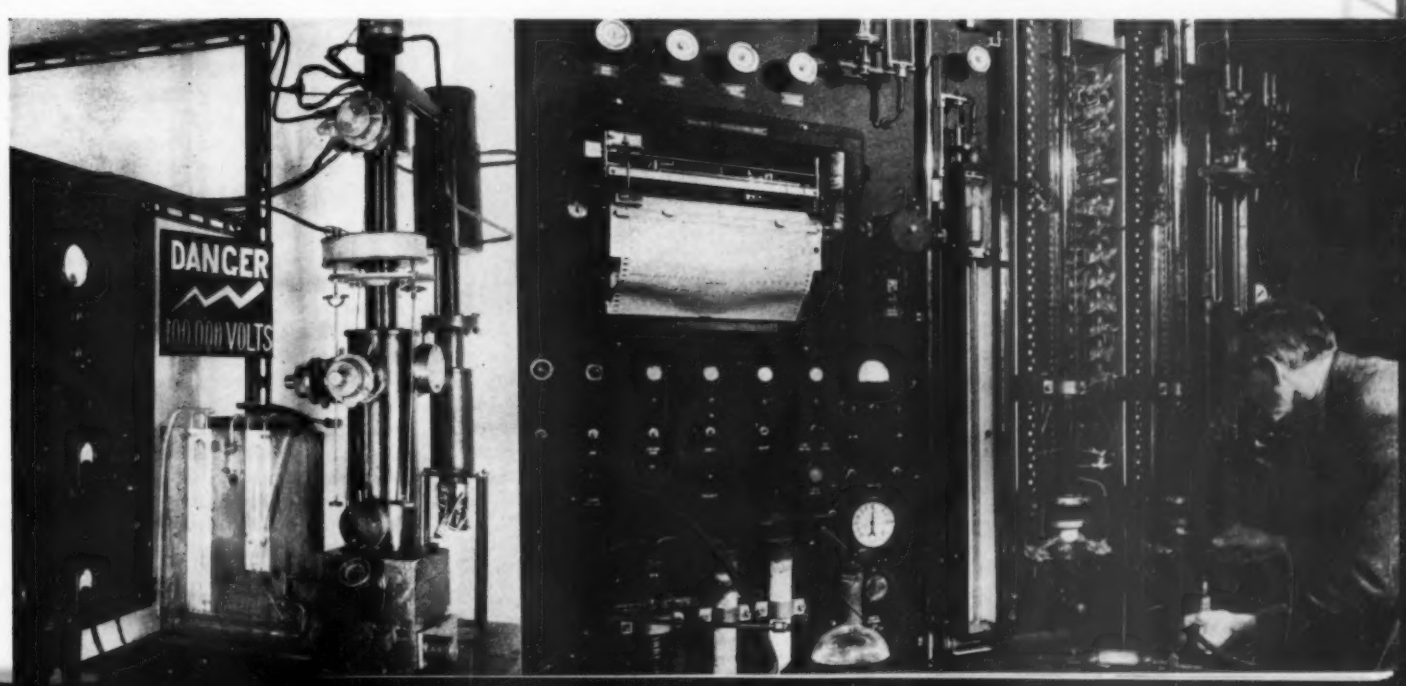
Another section deals with the preparation of pure hydrocarbons for standardization purposes. The physics section deals with all types of physical measurements, as mentioned above, spectrographic analysis, refractive indices, distillation problems, solvent extraction, particle size of catalysts and clays, to mention only a few. Special automatic recording units for spectrographic analysis have been developed in the laboratory.

The chemical research department has always been a prominent section of the Sunbury research center, and has developed many new processes in connection with the refining and utilization of petroleum; among them being the hypochlorite method of desulfurization of light distillates, the alkylation process, largely used in the production of high octane fuels, and the production of chemicals such as Iranopol and insecticides.

These activities in themselves generated further activities such as the design and utilization of a small scale plant for the development of the processes evolved from the research departments in which the techniques of the various processes could be studied before transfer to the pilot plant stage. These small-scale development laboratories are well equipped with all modern types of distillation, solvent extraction, dewaxing, refining and treating apparatus, enabling material to be produced in sufficient quantity for testing and grading quality as well as obtaining preliminary figures for production.

Electron diffraction camera used in lubrication research by Anglo-Iranian Oil Co.

Automatic apparatus for the analysis of gases by low temperature distillation in the Anglo-Iranian analytical laboratory.



Following the small scale development laboratories where work is mainly of bench type and carried out in glass apparatus, come the pilot plant laboratories, where the process so far developed can be transferred to the semi-works scale in which the major operating problems can be studied. These pilot plant laboratories are fully equipped with various forms of distillation plants, such as pressure, atmospheric and vacuum; with cracking plants, thermal and catalytic; with alkylation, isomerization, lubricating oil treatment and blending plants, including solvent extraction plants, propane de-asphalting plants, dewaxing and wax extraction and finishing plants.

The pilot catalytic cracking plant is of the fluid type which cost about £20,000 to install and involves in its operation eight chemists and nine other staff. It has a charging capacity of four to six barrels per day feed stock, and on it investigations can be made of working conditions, catalyst efficiency, yields, temperature effects and so on. In fact, the pilot plant development section can be classed as a complete refinery in miniature.

The engine research building, the latest addition to the research department of Anglo-Iranian, was formally opened in July 1948 by His Imperial Majesty, the Shah of Iran, and can be taken as the latest improvement on this type of building, designed solely for engine research. Fourteen engine beds are installed, some of which will take up to a rail car size diesel engine, or alternatively will accommodate two or more small units. These engine beds are all spring-mounted to avoid transmission of vibration to other units, and remote soundproof rooms for control of operations and housing of instruments are available for each engine base, two of the beds being suitable for tests under tropical conditions when desired. One striking feature of the test house is the location of all services, such as fuel, hard water, softened water for cooling, electricity, exhaust mains and control wiring, in a basement, thus giving complete individual accessibility to all test beds.

Instrumentation plays a very important part and has been lavishly adopted; so that any and every necessary observation of conditions of test can be taken and recorded, automatic controls and safeguards are also provided. Dynamometers of various types are installed for the measurement and recording of power outputs, friction losses, etc. If necessary, with these multiple controls engines may be left for periods quite unattended, thus leaving the operators free for visual observations of all kinds.

The arrangements are such that when an engine has completed its test, it can be removed immediately from its bed and transferred to the dismantling shop where it can be specially cleaned and rapidly stripped, ready for complete measurements to be made for wear, etc., prior to reconditioning and re-erection for further service, thus enabling the beds to be kept in almost constant operation. A photographic department is attached for the recording of wear and other phenomena developed during test periods, as well as a temperature controlled precision measurements room for recording those of new or reconditioned parts before the test and the amount of wear afterwards.

The primary work of the engine section is the carrying out of tests on the endurance and suitability of various lubricants for use in internal combustion engines of both spark and compression ignition types. The behavior of greases can also be examined. During these tests the various engines are run under standardized conditions which are chosen for their severity, in order to accentuate any defects in the lubricants. Several tests are made on each lubricant, each under standardized conditions, varied as required to cover all aspects of performance so that the merits of the lubricants for various purposes can be fully determined. Many of these tests are of long duration, so continuous day and night running is in operation.

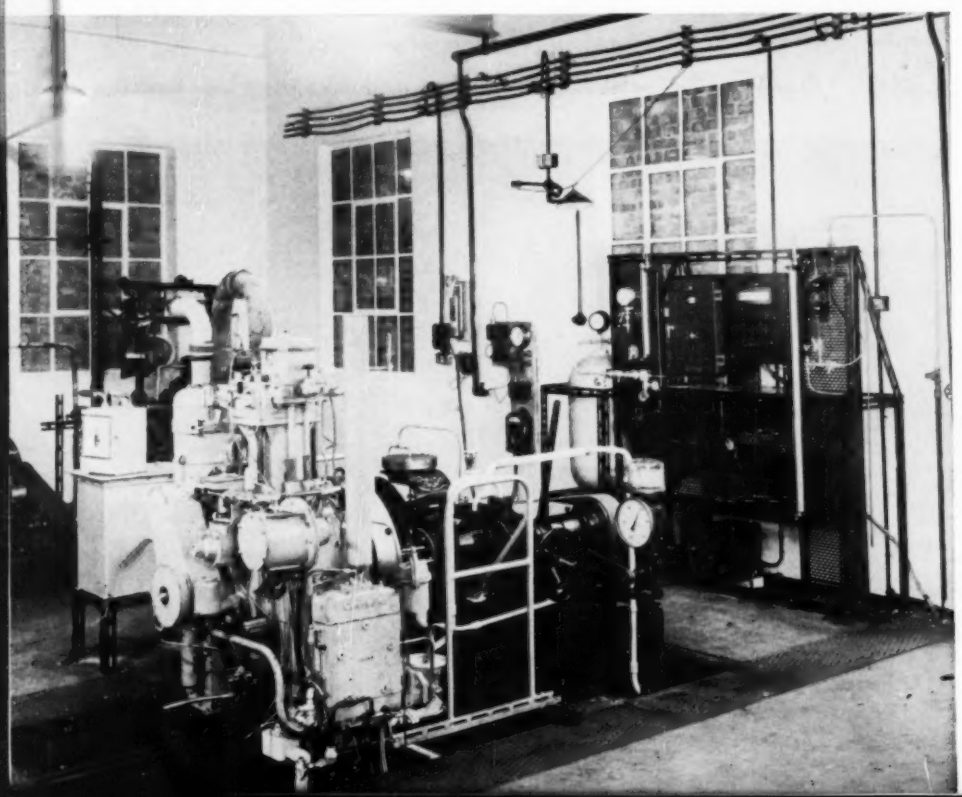
Among the more important factors which are examined are those of piston ring and cylinder wear and lacquering, ring gumming, bearing wear and corrosion, hot and cold sludging, general rate of lubricant deterioration and the effects of various types of additives on these factors. Gear oils, gears and industrial lubricants are also examined in a laboratory suitably equipped to carry out the tests under various conditions.

Attached to the station is a fleet of service vehicles engaged on road testing of various lubricants, with facilities for their dismantling and examination after tests together with reconditioning and reassembly.

In addition to this work on lubricants, research is also carried out on the more fundamental aspects of combustion and on the effects of various details of engine design, some of which can profoundly modify the behavior of fuels and lubricants. The results of this work are available to engine builders.

The whole department, therefore, comprises a collection of plant and instruments for the complete evaluation and examination of lubricants and fuels for any type of service.

Anglo-Iranian's caterpillar single cylinder test engine.



Manchester Oil Refinery began its operations in 1938, when opinions were divided as to the benefits of home refining and doubts were expressed with regard to its ultimate success. So successful, however, have been such operations that in 1948 the government approved the expenditure of £95,000,000 for the expansion of the home refining industry. An essential condition of successful home refining is maximum utilization of by-products, and this along with the manufacture of special products such as transformer oils, technical white oils and medicinal paraffin has formed the main basis for the research work.

The organization has also studied refining processes and products, extending from constitutional problems, the evaluation of thermodynamical data of materials, the mechanism of lubrication, flow of oil and the technical aspects of filtration and solvent recovery. The result of this intensive research has been that over 95 percent of the crude oil handled in the company's refinery is now converted into marketable products, including, in addition to its main body of lubricants, the manufacture of petroleum aromatic extracts, waxes, anti-corrosive and water-displacing oils, cutting oil concentrates, non-carcogenic mule-spinning oils and textile oils. A consider-

Machine-tool shop of the new Anglo-Iranian Oil Co. lube testing house.

The work-shop of the new Anglo-Iranian Oil Co. lubricating-oil testing house.

able amount of effort has also successfully been expended on the development of various sulfonates and sulfonic acids as fat-splitting agents, emulsifiers, wetting agents and detergents.

In addition to this type of work, the research organization has developed the Caterole process for the production of a full range of aromatic hydrocarbons and a mixture of gases rich in olefines from petroleum. In this process considerable ingenuity has been shown in the selection of optimum cracking conditions and in separating the products by cascade refrigeration and distillation. In 1946 the rights of this work were acquired by Petrocarbon, Ltd., and at the end of that year Petrochemicals, Ltd., was formed to carry through the project on an industrial scale.

Research is continuing by the process group on current and projected refinery processes and the chemical treatment of different crudes. The second group deals with special oils, improved lubricants and additives, engine tests and the fundamentals of lubrication; while the third group has for its prime objective the fullest utilization of sulfonates and other by-products.

The research department of Petrocarbon, Ltd., and Petrochemicals, Ltd., is devoting its energies to the further development of the Caterole process and intermediates for the synthetic organic industry. The Caterole process is fundamentally a high-temperature, vapor phase, catalytic cracking process, producing from any petroleum distillate boiling below 300°C a full range of cracking gases from methane to the butenes, together with a liquid product consisting mainly of aromatic hydrocarbons ranging from benzene up to highly condensed rings such as pyrene and chrysene.

A separation process for the uncondensible gases has been worked out, using liquefaction at low temperatures. In this connection research is also being carried out for the production of various aliphatic chemicals from the gases, such as ethylene chlorhydrin, ethylene oxide, ethylene glycol, propylene oxide, propylene glycol, isopropanol, acetone, etc., as well as other aliphatic and aromatic intermediates. The aromatic hydrocarbons produced from petroleum are oxygen-, nitrogen- and sulfur-free. In addition to the lower aromatics such as benzene, toluene, xylene, naphthalene and anthracene which in the past have mainly been obtained from coal-tar, higher aromatics such as A and B methyl naphthalene, fluorene, acenaphthene, phenanthrene, pyrene, benz-fluorene and chrysene are produced and can be purified economically. These latter promise to have considerable interest to the dye-stuffs industry as plasticisers and new monomers for the plastic industry in general. Research is also being carried out on the production of acetylene from other hydrocarbons.

The results of these researches are of great interest to the petroleum industry in general and bear promise of considerably extending the knowledge of the chemistry of the aromatic hydrocarbons.

The Burmah Oil Co., Ltd., instituted research as a definite branch of its activities about the year 1914, and it is of interest to record that in those early days the Anglo-Iranian Oil Co. shared the then slender research resources of the older company. In 1920 a site on the heights of Forest Hill in southeast London was acquired for development as a research station, and this property, known as Fairlawn, remains the chief center of the company's research activities and those of the associated Assam Oil Co., Ltd. In 1944 a large part of the premises was destroyed by a flying bomb. Pending the erection of permanent new buildings, delayed by building restrictions, excellent temporary accommodation has been provided, and the opportunity was taken to design and equip the new laboratories on the most modern lines.

At about the same time as the establishment of Fairlawn, a research department was instituted at the chief refining center, Syriam, Burma, and another subsequently at Digboi, Assam. While research at the refineries has naturally been concerned primarily with refining problems of the moment and with prospective process developments, considerable cooperation has been given to other research projects in which the London research department has been engaged, not excluding work on fundamental investigations as evinced by published papers.

Fairlawn, on the other hand, being detached from the refinery atmosphere and having readier access to other contacts in the industry, has enjoyed a wider scope for research. The distribution of effort on this basis has proved to be fruitful in results.

The Burmah Oil Co. has the rather unusual requirement to produce almost all current petroleum products of various grades and qualities from one crude oil. The Assam Oil Co. is in a similar position. This circumstance, together with that of constantly varying market demands and product values, obviously presents problems of somewhat unusual character in addition to those associated with development projects.

The high proportion of paraffin wax in the two crude oils has made it possible for the two companies to rank among the major producers of this valuable product. Hence, while the companies' research projects have covered a wide range of subjects, particular attention has been given to the study of the manufacture and utilization of paraffin wax and to fundamental investigations of its composition and properties, and several contributions have been made to the literature of the subject.

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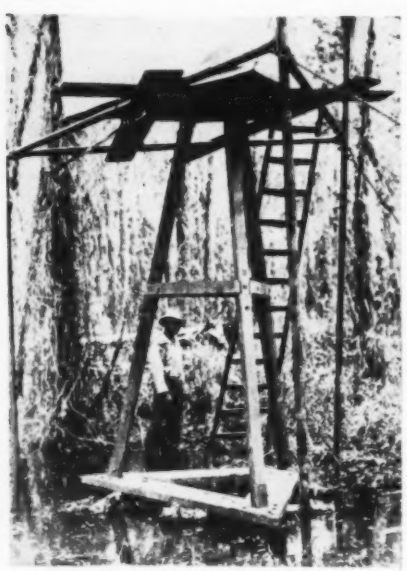
A further article describing research activities of other British oil companies will be published in an early issue—Editor.

Cooling towers at Pendopo gasoline plant in South Sumatra. Photo by Corsini for Standard-Vacuum Oil Co.

PROGRESS OF REHABILITATION IN INDONESIA

By E. Lawson Lomax

Gravimetrical survey in the coastal area of South Sumatra near Palembang. While this type of derrick is most satisfactory from a theoretical point of view it has been abandoned in the jungle because of the difficulties of transport. Photo copyright by Shell Photographic Unit, London.



London

CRUDE oil production in the Far East, comprising India, Burma, East Asia, Indonesia and Australia, at the beginning of 1948 was only half as large as in 1939, and by the end of that year it did not exceed three-quarters of the prewar rate. On the other hand, consumption is now about 35 percent higher than in 1939. As it was necessary before the war to import substantial quantities of petroleum products into the area, and since the United States can no longer provide shipments in the same volume as in the past, it will be appreciated that only from its own resources and from the Middle East can the Orient in future hope to satisfy its requirements of liquid fuels.

It is the purpose of this article to consider what contribution Indonesia—which, together with British Borneo, forms the most important producing area in the Far East—can make towards meeting the Orient's needs. With this object in view, it will be necessary to describe the oil-producing capacity of Indonesia in 1939, to examine how far that capacity was impaired through the ravages of war and to consider in the light of present-day political and economic circumstances what measure of success is attending the postwar rehabilitation program.

In the years preceding the outbreak of hostilities, the only islands in Indonesia that produced crude oil in commercial quantities were Sumatra, Java, Borneo and Ceram.

The operating company in Dutch Borneo is the Bataafsche Petroleum Maatschappij, a subsidiary of the Royal Dutch-Shell Group, which had developed fields at Tarakan, an island in the northeast, and at Balikpapan on the east coast. The Balikpapan fields were connected by pipeline to a refinery at Balikpapan. No refinery was needed for the Tarakan crude which has a high flash point and can be used without processing.

In Sumatra there were two main producing areas in which both BPM (Royal Dutch-Shell) and Standard Vacuum Petroleum Maatschappij held concessions. Standard-Vacuum is the chief United States oil interest in the East Indies. The Palembang fields in the south were the richest and their output supplied the refineries at Pladjoe (BPM) and Soengei Gerong (Standard-Vacuum); oil from the north Sumatra fields was processed at Pangkalan Brandan (BPM) on the northeast coast of the island. In addition the Nederlandsch Indische Aardolie Maatschappij, owned half by BPM and half by the government, worked concessions in the Djambi area, north of Palembang, and at Poeloe Pandjang, north of Pangkalan Brandan.

The fields in the Rembang and Sourabaya areas comprised the two producing regions in Java. Most of the crude was refined at Tjepoe (BPM), but a small part was processed at Wonokromo. In addition part was shipped to Balikpapan for refining. Both BPM and Standard-Vacuum operated in Java. The Sumatra and Borneo crudes are particularly valuable for their ability to produce components for high-octane gasoline, a feature of special importance for the production of aviation fuel, while Indonesian crudes generally are a source of good quality kerosene.

Apart from the three main producing islands, there was a small production on the island of Ceram which was sent to Balikpapan for processing.

The installations at Pangkalan Brandan, Pladjoe and Balikpapan were all full-scale refineries with distilling, extraction and treating units for all main products. In addition Balikpapan possessed wax and lubricating oil, grease and asphalt plants and there was a wax plant in Tjepoe and an asphalt plant at Wonokromo. The other refineries were on a smaller scale designed to treat the crude produced in their areas.

The damage done to oil properties in Indonesia during the war can be attributed to three causes. Allied denial measures were extensively carried out before and at the time of the Japanese invasion; sustained air attacks were launched against the enemy during the period of their occupation, and Allied re-occupation of Borneo in 1945 was attended by further destruction of facilities.

The possibility of a Japanese invasion in Indonesia had not been overlooked by the authorities, and detailed plans for demolition had been prepared by the military with the technical advice of oil industry personnel. As far as surface equipment was concerned, all vital parts of installations which were not in operation nor required for the execution of the denial schemes had been removed and collected together at places where they could easily be destroyed. Various means of destruction were employed. The thoroughness with with these preparations were made can be judged from the fact that, by the time the enemy had launched their invasion, demolition had taken place according to plan in all cases, save at Pladjoe where the unexpected intervention of Japanese parachutists prevented the work from being finished.

In order to start production and refining operations again, the Japanese in general had to depend on make-shift arrangements. During the three-year period, 1942-1945, they extracted 76,750,000 barrels of crude oil in total production (1939 production, 59,887,000 barrels), but the quality of products manufactured from these crudes was considerably inferior to that obtained before the war, as in many cases the Japanese could not rebuild the installations or lacked sufficient technical knowledge to operate them to the fullest advantage. Some new facilities were constructed, however, and the distilling unit for the Wonokromo refinery, which in 1944 suffered severe damage from air bombardment, was rebuilt in a native village, Bendoel, about one kilometer distant.

The oil output of the East Indies was of supreme importance to the Japanese war effort, and as it all had to be shipped away to where it was required, tanker transportation became a vulnerable link in the enemy chain of supply which the Allies were quick to exploit. Tankers were harried by Allied submarines with the utmost persistence, and when, with the progress of the war, naval bases were acquired nearer the Philippines and Japan, the volume of tanker tonnage sunk eventually exceeded new construction. This loss constituted a serious blow to Japanese strategy, and their inability from mid-1944 onward to ship products away from Indonesia was reflected in a steadily decreasing production in the islands.

This reduction in output, however, cannot be accounted for alone by the shortage of tanker tonnage. The Allied air forces were meting out heavy punishment to the oil properties and serious damage was done to installations at Balikpapan, Tarakan, Wonokromo and Pangkalan Brandan. Early in the war air attacks compelled a complete cessation of operations on the island of Ceram. In the course of 1944 the Japanese shipping situation had become so difficult that there was no further need for bombing raids until the commencement of the Allied invasion on May 1, 1945.

The first center to be recaptured was Tarakan, while the oil fields and refinery at Balikpapan fell two months later. Unfortunately the reoccupation of these centers was not effected without more widespread destruction of oil property. The Japanese adopted a scorched earth policy; also the invading forces used explosives on oil installations and facilities in the course of their military operations. In addition Japanese neglect had impaired the efficiency of much of the equipment left undamaged. As the war ended suddenly in August 1945, Sumatra and Java escaped at that time further war damages.

Indonesian Refining Capacity

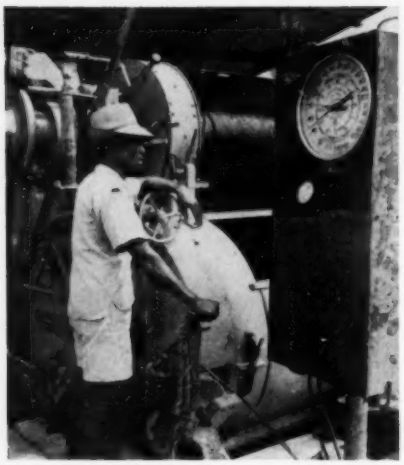
Company	Location	Crude Capacity 1939 BD	Crude Capacity 1949 BD
Borneo:			
De Bataafsche Petroleum Mij. (Shell)	Balikpapan	35,000	8,500
Java:			
De Bataafsche Petroleum Mij. (Shell)	Wonokromo	2,500	1,500
	Tjepoe	11,000	—
Standard-Vacuum	Kapoean	500	
Sumatra:			
De Bataafsche Petroleum Mij. (Shell)	P. Brandan	18,000	—[1]
	Pladjoe	45,000	45,000
Standard-Vacuum	Soengei-Gerong	45,000	47,000
Total		177,000	137,000

[1] Inaccessible

Total Indonesian Crude Production
(Barrels per Day)

	1938		June 1948	
	Production	No. of Wells	Production	No. of Wells
Sumatra:				
B.P.M.	33,800	489	28,140	96
BPM (NIAM fields)	34,800	168	Nil	Nil
Standard-Vacuum	40,600	456	45,200[1]	363
Java:				
BPM	19,000	449	1,270	46
Standard-Vacuum	145	23	Nil	Nil
Neth. Borneo incl. Tarakan:	33,400	743	15,510	501
Ceram:	1,500	46	Nil	Nil
New Guinea	Nil	Nil	Nil	Nil

[1] 50,857 barrels daily from 410 wells at end of 1948.



Indonesian driller employed by Standard-Vacuum Petroleum Maatschappij in the Pendopo fields, South Sumatra. Photo by Corsini.

The task that faced the oil companies when they returned to their properties was, therefore, of an impressive magnitude. Oilfields had to be reopened and installations needed rebuilding. It has been estimated that the rehabilitation program may require up to two millions tons of equipment, materials and machinery. To make matters worse there was a shortage of trained native staff, whose numbers had been greatly depleted by the war.

A further very serious complication has been the political situation in Indonesia, which until recently prevented the fields and refiners at Tjepoe (Java) and Pangkalan Brandan (north Sumatra) and the fields in central Palembang and Djambi (south Sumatra) from being restored to their rightful owners. The latest measures of the Dutch government in December 1948 brought the refinery and fields in the Tjepoe region and the central Palembang and Djambi fields again under control. Much damage appeared to have been done.

Restoration measures have, therefore, up to now been principally concentrated in Borneo and southern Sumatra. No work has yet been possible in Ceram, while the unsettled political conditions in Java have confined rehabilitation to a limited area around Sourabaya. A large area of Sumatra is still in a confused state, but the producing fields of the south have been in the hands of their prewar operators since the middle of 1947.

In the fields of Balikpapan and Tarakan drilling has been resumed, and repair strings are working to improve the existing wells. Two Trumble distilling units built from recovered and scrap material were put back into operation at Balikpapan in 1946, while the remainder of the refinery is being rebuilt. The output is now somewhat more than a quarter of its prewar capacity. The pipelines from the fields to the north of Balikpapan have been partly renewed. By the middle of 1948 production at these fields had reached nearly 9,000 barrels daily, and at Tarakan had recovered to more than half the 1938 rate. Restoration is still a fairly slow process, but it must be remembered that the companies have been impeded by lack of material and means of transportation and have suffered from a shortage of trained native staff.

In some ways Java and Sumatra have labored under even greater difficulties than Borneo. Much territory containing oil properties remained inaccessible, and so production, although it has steadily risen since the termination of war, is of necessity well below its prewar level. In Sumatra where the oil companies have been able to return to the southern fields, production by the end of 1948 attained a rate of 110,000 barrels daily, which is only 5,000 barrels short of the prewar rate for the whole island. The producing areas of Royal Dutch-Shell in the north, together with the refinery at Pangkalan Brandan, have remained out of reach. When they are reoccupied, rehabilitation will be made more difficult by the destruction in the middle of August 1947 caused by extremists of the area after cessation of hostilities. Not only has this caused a loss of refining capacity amounting to six million barrels a year, but the replacement cost is estimated at $10,000,000.

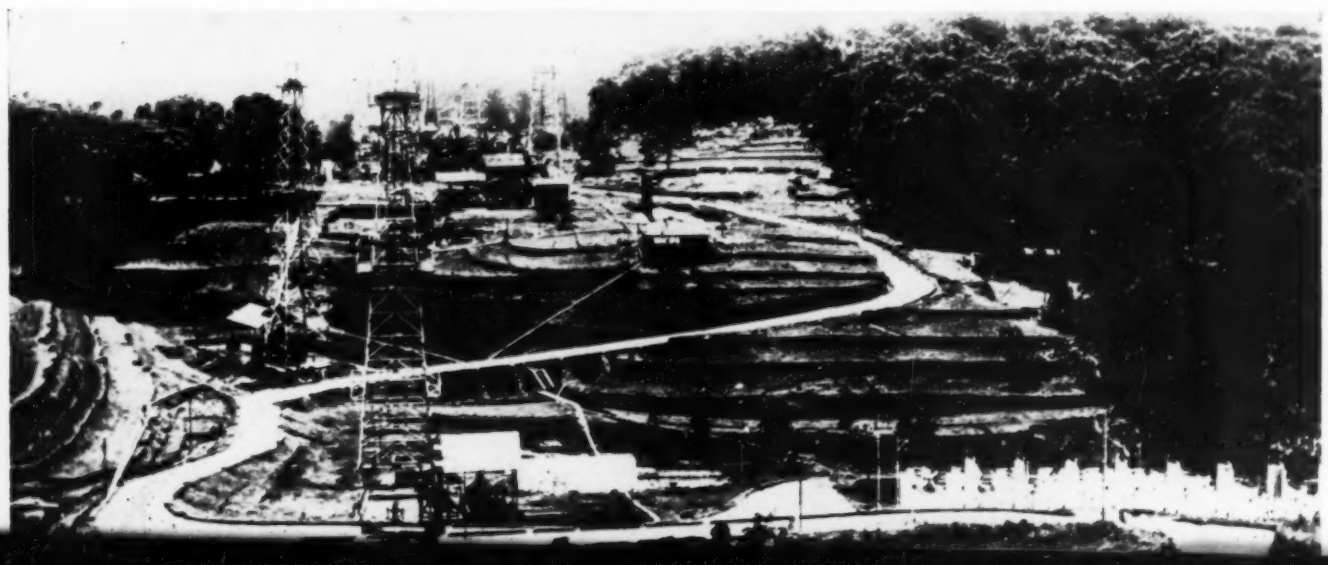
The Pladjoe refinery was found to be very badly run down due to lack of maintenance and bomb damage, but reconditioning, which began in October 1946, has since enabled it to exceed its prewar capacity of 45,000 barrels daily. Standard-Vacuum's refinery in Soengei Gerong is rehabilitated and now operating at a rate of 55,000 barrels daily.

The Sourabaya area in Java is now producing over 1,200 barrels per day of crude oil, which is treated at Wonokromo refinery, but central Java remained inaccessible for the normal resumption of work up to the end of 1948. Now that refinery and fields are under control again, a tremendous amount of rehabilitation work lies ahead.

In New Guinea there are large areas of land suitable for oil exploration, and geologists are of the opinion that the island may become an important source of oil. Before the war the Nederlandsche Nieuw Guinee Petroleum Maatschappij (NNGPM) began exploratory work in 1935 on a very large concession in the north and brought in evidence of oil. NNGPM is owned 40 percent by Royal Dutch-Shell through BPM, and 60 percent by American interests. BPM is the manager. The work was resumed after the war and already shows substantial results, the first exploitation having started in December 1948 on the Klamono field, from which the first crude was shipped to Sorong near the end of the year when production amounted to about 4,000 barrels daily. Operations are difficult because of lack of transporation, dense jungle and tremendous rainfall, but, even so, a road of 30 miles with an eight-inch pipeline has been completed from Klamono to the port of Sorong. The harbor facilities at Sorong have been improved, while the construction of temporary accommodation, storage, shops, electric power stations and other facilities continues apace.

The New Guinea campaign is the only major exploratory work now under way in Indonesia, but exploration is going forward in the Australian territory of Papua in the southwest of New Guinea, by the Australian Petroleum Co., owned 40 percent by Standard-Vacuum, 40 percent by Anglo-Iranian and 20 percent by Oil Search, Ltd., an independent Australian company.

An oil field in Java operated by Shell interests. Shell Photo.



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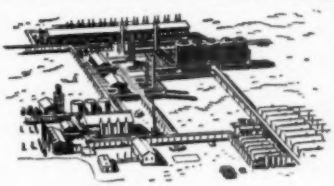

● Shell Oil Company's TXL Gasoline Plant near Odessa, Texas. This is a prime example of Brown & Root's flexibility in meeting the demands of a client's changing conditions. The original contract called for a 30,000 mcf gasoline plant. During plant construction the mcf was revised to 45,000. Shortly after completion, the throughput demands were raised to 90,000 mcf . . . triple the original requirements! Farsighted planning by Brown & Root engineers allowed continuous plant operation while this tremendous project was effected.

● Offshore drilling. Derrick foundation constructed by Brown & Root Marine Operators, Inc., for a drilling operation far out in the Gulf of Mexico. "Brown-Bilt" in six fathoms of open water, its crown block towers 237 feet above the floor of the turbulent Gulf. It must withstand not only storms of hurricane strength but also the rigors of heavyweight rotary drilling operation.

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International News and Notes

George L. Macpherson

GEORGE L. MACPHERSON, formerly manager of Imperial's engineering and development division of the manufacturing department, has been appointed general manager of refineries for Imperial Oil, Ltd. A native of Markdale, Ontario, and a graduate of the University of Toronto, Mr. Macpherson joined Imperial in 1922 as a draughtsman. In 1937 he was appointed assistant chief engineer and in 1943 became chief engineer and later manager of the engineering and development division. Last year he was elected president of the Ontario branch of the Association of Professional Engineers.

New Field in Germany

Preliminary tests of the wildcat well, Ruehlertwist No. 2 drilled in Lingen, Germany, near the Dutch border, yielded 50 to 100 barrels from a depth of 2,428-2,461 feet. Only 33 feet of the oil horizon (Bentheimer Sandstone) had been drilled when the tests were made, and the well is now being deepened. Seismic tests indicate a new oil field extending several miles east-west of the well.

Colombian Oil Consumption

In the first quarter of 1949 demand for gasoline in Colombia increased 13 percent over the same period last year. In 1948 Colombia consumed 6.18 million barrels of oil, of which 2.91 million barrels was gasoline and 3.27 million barrels of other products. Of the refined products consumed, 4.36 million barrels were domestic and 1.82 million barrels imported. The bulk of the refined products imported consisted of gasoline. Surveys are being conducted currently to determine how and by how much domestic refining should be increased.

Assistant to President

Dr. Luis Herrera F., who became a member of the staff of Mene Grande Oil Company of Venezuela in 1946, with headquarters in Caracas, has been named assistant to Hoyt Sherman, the company's new president. Dr. Herrera was a director in the Oficina Tecnica de Hidrocarburos (1943-46) and prior to that was connected with the Paraguana Petroleum Corporation. In 1929 he was graduated from Venezuela's Central University at Caracas, and in 1938 obtained the degree of petroleum engineer at the University of Texas.

Foster Wheeler to Build Fawley Plant

Foster Wheeler Corporation has been awarded a contract calling for the construction of Europe's largest oil refinery at Fawley, England, Harry S. Brown, chairman of the board, has revealed. Foster Wheeler will provide mechanical design, engineering and will construct nine processing units. The nine units will consist of a 60,000 barrels per stream day, two-stage crude distillation unit; 50,000 BPSD single-stage crude distillation unit, fluid catalytic cracking unit; a catalytic cracking and crude gas compression unit; light ends unit, three sweetening units for crude and catalytic cracking naphthas; and an Edeleanu treating unit.

With the exception of tankage, marine facilities and administration and laboratory buildings, Foster Wheeler will also erect all off-site facilities including a complete steam plant.

Preliminary work on the new project for Anglo-American Oil Company, Ltd., British affiliate of Standard Oil Co. (N.J.), already is under way.

The refinery, which will have a capacity of 110,000 barrels per day, is scheduled for completion in about three years and has been estimated to cost $150,000,000. It will manufacture gasoline, kerosene, gas and diesel oils, heavy residual fuel oils, asphalts and certain special products.

Frank H. Carlson

Returns to Australia

Frank H. Carlson has been elected a director of Vacuum Oil Company, Pty., Ltd., Melbourne. He returns to Australia to take up his new duties after having served four years with Vacuum's parent company, Standard-Vacuum Oil Company, in New York. Mr. Carlson returned to the United States after the war and in 1946 was made treasurer of Standard-Vacuum. Prior to that he had occupied high executive posts in Australia for 16 years. During the war he played a prominent part in fostering Australian-American relations, serving as president of the American Society of Sydney. He also helped found the American Center for Servicemen in that city.

CLAUDE ETTELE, employee relations manager of Standard-Vacuum Oil Co., will retire on July 15 after 33 years' experience in the petroleum industry, 30 of which were spent in Japan. Beginning as an assistant accountant in Kobe in 1917, he shifted to marketing and advanced to assistant general manager for Japan in 1932. Early in 1942 he was imprisoned by the Japanese military authorities and held until his repatriation on the Gripsholm later that year.

Following his return to the United States, Mr. Ettele joined the armed forces and served as executive officer of the U. S. Army's Petroleum and Fuel Division both in the ETO and later in Japan. In 1946 he returned to Standard-Vacuum and was named to head the Japan Oil Supply Company, a petroleum distributing agency set up in Japan by the oil industry at the request of the War Department.

Henry on European Trip

Francis J. Henry, president of Atlas Lubricant Corporation of New Orleans, left early in June on an extended business trip through England, Holland, Belgium, France, Switzerland and Italy. His company is a large, independent manufacturer and exporter of petroleum products including lubricating oils and greases.

COL. ROBERT W. McCLENAHAN, formerly assistant chief of staff intelligence for Gen. R. L. Maxwell, commanding general U. S. Army Forces in the Middle East, and currently an employee of the production department of Gulf Oil Corp., has received the Order of the British Empire at the British Embassy in Washington. The honor, conferred by Sir Oliver Franks, was in recognition of unusual service during the period prior to the Battle of El Alamein.

Geological Laboratory for Oxford

Oxford University is opening a new laboratory in its department of geology and mineralogy, made possible by a gift of £25,000 ($100,000) from Shell. Formal opening of the laboratory takes place on July 7 in connection with the fourth Empire Mining and Metallurgical Congress, which will bring together geologists, mining engineers and metallurgists from all parts of the British Commonwealth.

W. D. C. MACKENZIE, formerly chief engineer with the producing department of Imperial Oil Ltd., in Toronto, has been transferred to Calgary as assistant manager of the western division of the producing department. A graduate of the University of Alberta, Mr. Mackenzie joined Imperial at Calgary in 1936. The following year he took charge of sub-surface geological work in the Turner Valley field and later was transferred to the petroleum engineering department there. In 1942 he joined the Canol project working with the U. S. government. After this contract ended in 1945, he spent several months in New York before assuming the position of chief engineer at Toronto.

W. D. C. Mackenzie

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Progress of Canadian Oil Line

Ground survey work on the 20-inch, 450-mile Edmonton-Regina crude oil line is proceeding rapidly, Dr. O. B. Hopkins, newly appointed president of the Interprovincial Pipe Line Co., Ltd., has announced. Authority of the board of transport commissioners to construct the line has been given. Air mosaics have been taken and studied to determine the best route. The line will take a fairly direct course, avoiding lakes, towns and other obstacles. Ground survey parties will work at several points along the line for greater speed. Imperial considers the Edmonton-Regina line a "first step" towards wider markets and is now studying extension of the line from Regina to the Great Lakes.

Officers of the Interprovincial Pipe Line Co. in addition to Dr. Hopkins, are: vice president and director, F. G. Hall; secretary, R. D. Murray; treasurer, K. A. Henderson; directors, A. E. Halverson, J. R. White, C. D. Crichton and R. B. Burgess. All are officials of Imperial Oil which is sponsoring the Interprovincial Pipe Line Co. The new company has an authorized capital of $200 million.

Celebrates Fiftieth Anniversary

The Wakefield Oil Co., famous British lubricant manufacturer and distributor, celebrated recently the 50th anniversary of its founding in 1899 by the late Viscount Charles Wakefield. Lord Wakefield died in his 81st year in 1941. Since his death the formerly private company has been reorganized as a public company with control vested in a board consisting largely of employees.

Lord Wakefield was 40 when he formed his own company to sell railroad oils. His research during development of the gasoline engine resulted in the production of Castrol which was used by allied bombers in World War I under conditions which demanded a low cold test lubricant. In the period between the wars he was a supporter of developments in high-speed transportation equipment in the air, on land and on water.

Charles Wakefield was elected a sheriff of the City of London in 1907 and was knighted and became a city alderman in the following year. He was Lord Mayor of London in 1915-16 and received a baronetcy at the end of his term of office. In 1930 he was raised to the peerage as Lord Wakefield of Hythe and four years later became the first member of the motor trade to be created a viscount.

James MacPherson

JAMES MACPHERSON has resigned as vice president and resident manager for the Arabian American Oil Co. in Saudi Arabia and has accepted appointment as vice president and general manager in charge of American Independent Oil Company's new operations in the Kuwait-Saudi Arabian neutral zone on the Persian Gulf. His resignation from the Standard group and his appointment in American Independent become effective Aug. 1. He will make his headquarters in the city of Kuwait.

Under the terms of the concession entered into a year ago, Aminoil was granted full oil rights to the Shaikh of Kuwait's undivided half interest in the neutral zone which he owns jointly with King Ibn Saud of Saudi Arabia, and which joins Kuwait on the south. Exploration activities are well advanced and drilling and development work will go forward immediately in the area Aminoil has under concession, according to Ralph K. Davies, president.

Mr. MacPherson began his oil career in Seattle, Washington, in 1919 following service in World War I where he served with the British Expeditionary Forces in the Sinai Palestinian campaign. In 1940 he was transferred from Standard of California to California-Arabian Standard Oil Co., the forerunner of Arabian American Oil Co. Subsequently he became secretary-treasurer, vice president and a director of Aramco.

New Thermometer Catalog

A new catalog No. T/40 describing mercury-in-steel thermometers has been published by Negretti and Zambra, Ltd., 122 Regent St., London, W1. The 44-page catalog gives complete constructional details of the instruments with tabulations showing standard ranges, bulb fittings, prices and other pertinent data. Representatives in England and in foreign countries are listed.

Colombian Production

Production of crude oil and condensate in Colombia during April totaled 87,957 barrels daily compared with 83,980 barrels in March, and 76,907 barrels in January. In the Yondo area Shell interests have increased production from 11,457 barrels daily in January to 20,642 barrels daily in April. Production from De Mares is up about 4,000 barrels daily over the first of the year to 34,312 barrels daily.

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Buys Interest in Canadian Properties

Phillips Petroleum Company has bought a half interest in properties of Husky Refining Co., Cody, Wyoming, and Husky Oil and Refining Ltd., of Calgary, Canada. The interest is in all of the petroleum and natural gas rights of the Husky companies in the Province of Alberta and Saskatchewan, Canada, except the black oil rights in the Cretaceous formation of the Lloydminster area. This deal involves rights under approximately 4,850,000 acres of land in these two Canadian provinces.

Make Shand & Jurs Fittings in Britain

Through an agreement concluded between Whessoe Ltd. and Shand & Jurs of Berkeley, California, the first named firm will manufacture Shand & Jurs specialties in England. Through this arrangement the extensive line of fittings for petroleum tanks and pressure vessels developed by the American company will be made available to purchasers within the sterling area from Whessoe works in Darlington or the company's export office in London.

New Directors Elected

Frederick R. Ryan, president of American Maracaibo Co., has announced the election of two new directors: James J. Sullivan, vice president of Blair & Co., Inc., and James Carey Warren, partner of A. M. Kidder & Co. American Maracaibo has oil interests in Venezuela, Texas and Colombia, S.A.

To Build Dehydration Plant

The chemical plants division of Blaw-Knox Co. has received a contract for the engineering and procurement of a dehydration plant to serve the Argentine government's 1200-mile gas line now under construction. A dry type dehydration process will remove water vapor from 35 million cubic feet of gas per day at a minimum pressure of 1,000 pounds and will effect a minimum water vapor dew point repression of 70°F. The contractor is Agar Cross & Co., Ltd., of New York and Buenos Aires.

Venezuelan Production

Production of crude oil in Venezuela during the month of April amounted to 35,999,522 barrels, an average of 1,199,984 barrels daily. As compared with March this daily average is higher by 45,399 barrels. Exports for the month totaled 28,878,056 barrels. Production by companies is shown in the following table:

Company	West	East	Total
Creole	11,538,819	3,427,385	14,966,204
Mene Grande	981,362	5,095,175	6,076,537
Shell	12,217,413	—	12,217,413
Sinclair	—	478,860	478,860
Socony	—	1,024,261	1,024,261
Texas	—	248,572	248,572
S.A.P. Las Mercedes	—	460,346	460,346
B.C.O.	30,254	—	30,254
Phillips	—	124,151	124,151
Rexco	97,410	—	97,410
Atlantic	—	270,727	270,727
Guasare	4,787	—	4,787
Total	24,870,045	11,129,477	35,999,522

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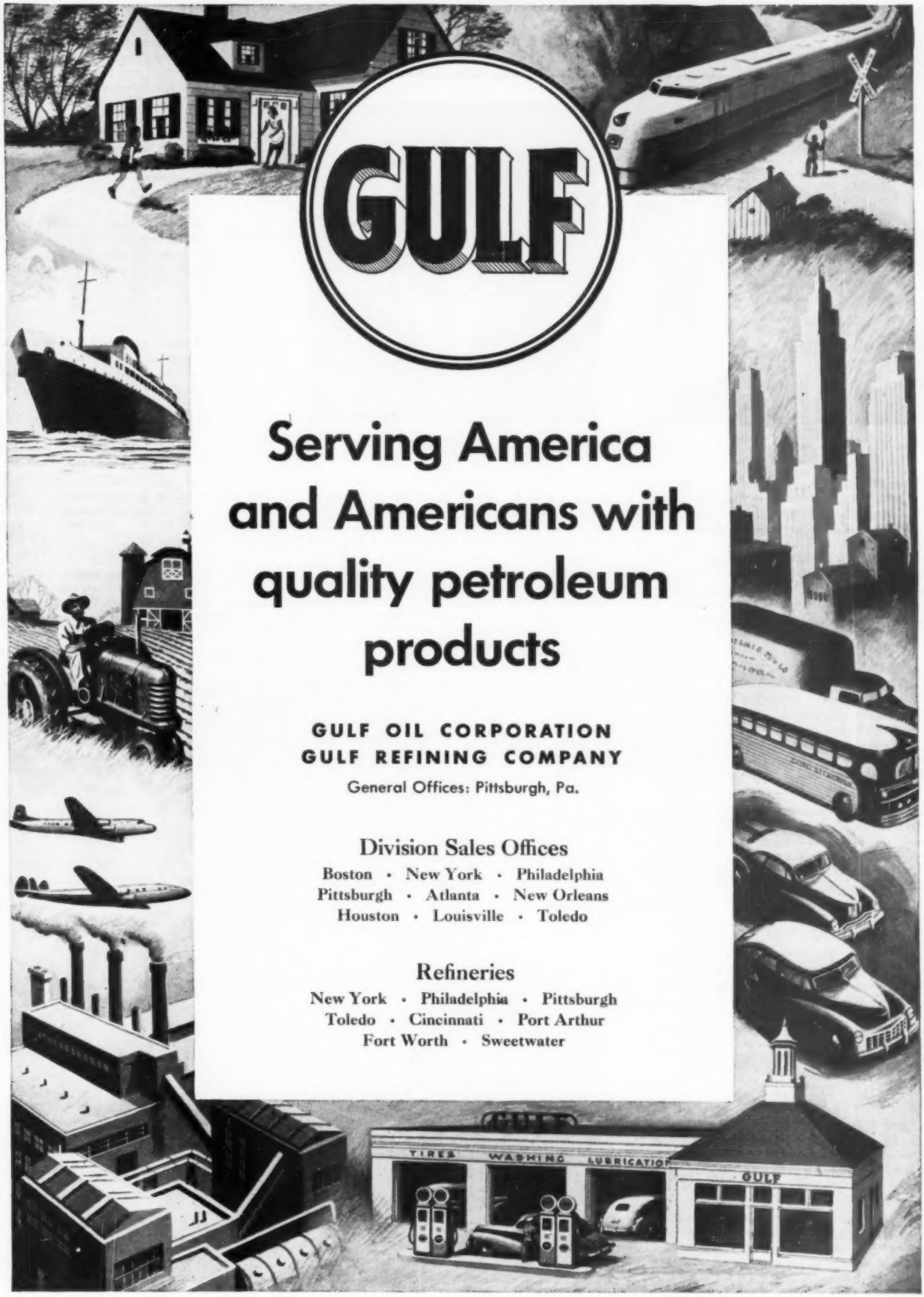
Hayward-Tyler "House Warming"

Messrs. Hayward-Tyler & Co., Ltd., recently entertained a group of visitors at a "house warming" to inspect the latest addition to their works at Luton, Bedfordshire, England. Although the firm is among the oldest and most widely known of British manufacturers of pumping machinery, many additions and improvements to its plants have been made to take care of expanding requirements.

In the marine field, it is stated, approximately one-third of all oil tankers above 1,000 tons are fitted with Hayward-Tyler pumps ranging in capacity from 200 to 500 tons per hour. Practically all types of pumps used in the petroleum industry are manufactured, including process pumps for refinery work. About two years ago the firm made an arrangement with Byron Jackson Company for construction at Luton of that company's well-known line of American pumps, and the latest additions to its range of process pumps are the Hayward-Tyler-Byron Jackson single-stage and two-stage pumps with speeds up to 3,600 rpm and capacities up to 2,900 Igpm with British and American made parts interchangeable.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OIL COMPANY STAFF CHANGES

J. A. La Fortune

Marvin L. Gosney

J. A. LaFORTUNE, executive vice president and director of Warren Petroleum Corp., has been elected a director of the Oklahoma Natural Gas Company. A past president of the National Gasoline Association of America and active in other oil industry organizations, Mr. LaFortune has had an interesting and colorful career. He is a director of the Public Service Company of Oklahoma and has been active in the Tulsa Community Fund, Hillcrest Hospital campaign, St. John's Hospital campaign and was recently elected president of the Southern Hills Country Club.

The young oil executive served as secretary of the Mid-Continent Oil & Gas Association in 1923 and joined Warren Petroleum Corp. on Jan. 15, 1924 as secretary and a stockholder. He was elevated to vice president in 1929 and later to executive vice president. He is also a director of Warren Petroleum Corp., vice president and director of Warren Pipe Line, Warren Oil, Warren Maritime and Natural Gasoline Corp.

Mr. LaFortune, an alumnus and member of the board of lay trustees of the University of Notre Dame, recently received the honorary degree of Doctor of Laws from his alma mater. He is a director of Cascia Hall, Tulsa, a member of the trustees advisory council, University of Tulsa, and the TU Downtown Quarterback Club.

ROY J. DIWOKY, formerly of Standard Oil Co. (Ind.), has become executive assistant to the president of Pan American Petroleum Corp. Mr. Diwoky will be located at the New Orleans, La., headquarters of Pan American and will serve as a director of that corporation. Mr. Diwoky joined Standard Oil Co. (Ind.) in 1935 and transferred to the manufacturing department in 1940, where he rose to the position of assistant general superintendent of the Whiting, Ind., refinery.

RALPH E. CLARKE, treasurer of Standard Oil Co. (Ind.), retired June 16. Walter A. Culin, assistant treasurer, has been elected to succeed him. Mr. Clarke joined the company Nov. 9, 1906, as a stenographer in the general office at Chicago. He was made general auditor in 1921 and treasurer in 1939.

Mr. Culin joined Standard in 1945 as assistant treasurer, after serving as a vice president, treasurer and a director of Federal Water and Gas Corp. of New York City. He was associated with Federal for 19 years.

P. C. SPENCER, president, Sinclair Oil Corporation, has announced the election of Marvin L. Gosney as executive vice president. Mr. Gosney joined the Sinclair organization in 1916 and the following year was made treasurer of the Sinclair Refining Co., with offices in Chicago. In 1925 he moved to New York as assistant treasurer of Sinclair Oil Corporation, which position he held until 1940 when he was elected treasurer. In 1941 he was made vice president and treasurer and in 1942 was elected a director.

DR. GUSTAV EGLOFF of Universal Oil Products Co. was awarded honorary membership in the American Institute of Chemists at a meeting in Chicago on June 3. Dr. Egloff has been active in the work of the Institute for a number of years, having served as president from 1942 to 1946.

GEORGE F. JAMES has been named treasurer of Standard-Vacuum Oil Co. effective Aug. 1. He succeeds Frank H. Carlson who has returned to the Australian company as director. Mr. James has specialized in the study of international taxation problems since joining the company's legal department in 1944 as an attorney. Prior to that time he had been a practicing attorney in Chicago and associate professor of law and assistant dean at the University of Chicago.

George F. James

C. F. SMITH, superintendent of the light oils division of the Whiting, Ind., refinery of Standard Oil Co. (Ind.), has been promoted to assistant general superintendent of the Whiting refinery. He succeeds Roy J. Diwoky, who has become executive assistant to the president and a director of Pan American Petroleum Corporation, a Standard subsidiary with headquarters at New Orleans, La. C. E. Evans, assistant superintendent of the light oils division at the Whiting refinery, succeeds Mr. Smith, and Dr. Ford H. Blunck, general foreman of the pressure stills department in the light oils division at Whiting, succeeds Mr. Evans.

Mr. Smith joined Standard of Indiana in 1928 in the engineering department at the Whiting refinery. He was made general foreman of the catalytic cracking department in 1946, assistant superintendent of the light oils division in 1947, and superintendent of the light oils division in 1948. Mr. Evans joined Standard in 1937 as a chemical engineer in the research department at Whiting, and in 1942 was transferred to the manufacturing department. Dr. Blunck joined the company in 1936 as a chemist in the research department at Whiting and was transferred to the manufacturing department in 1945.

W. T. CRAVENS has been appointed assistant general superintendent of the refining division of Cities Service Oil Co. (Del.). He will act as assistant to Lee Haugen, who is general superintendent in direct charge of all refinery operations. Mr. Cravens has been with the Cities Service companies for the past 12 years, having worked at Shreveport, Lake Charles and recently in the New York office for Petroleum Advisers, Inc.

HERMAN G. GUNTER has been appointed superintendent of The Carter Oil Company's new Billings, Montana, refinery which is scheduled for completion late this summer. Mr. Gunter has been with Standard Oil Co. (N. J.) since 1930, and before going to Billings two years ago, was process superintendent of the Baltimore refinery.

J. B. HARSHMAN, formerly general manager of Stanolind Pipe Line Co., Tulsa, and more recently in charge of pipeline operations for Utah Oil Refining Co., Salt Lake City, has resigned to become general manager of construction on the eastern end of the new Transcontinental Gas Line being laid by Fish Constructors, Inc. His headquarters will be at Newark, N. J.

W. F DAU has been elected treasurer of Sinclair Oil Corp. to succeed Marvin L. Gosney, who was elected executive vice president. Mr. Dau joined the Sinclair Refining Company in 1917 and was elected vice president and assistant treasurer in 1943.

W. F. Dau

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AGENTS THROUGHOUT THE WORLD

C. E. Streeter

John H. Schaefer

CLARENDON E. STREETER has been elected president of the Pennsylvania Grade Crude Oil Association at its recent annual meeting in Pittsburgh. Long prominent in the Pennsylvania oil industry, Mr. Streeter has been a director of the Pennsylvania Grade Crude Oil Assn. since 1938. He is a past president of the Bradford District Pennsylvania Oil Producers Assn., having led that organization in 1935-36. He is one of the original directors still serving on the Bradford association's board. He is a director of the Independent Petroleum Association of America and has been active in the program of the Interstate Oil Compact Commission since its inception.

STANLEY LEARNED has been elected a director of Phillips Petroleum Co. and a member of the executive committee. On the board he succeeds the late Ch. A. Lemp of St. Louis. The vacancy on the executive committee was created by the recent retirement of Frank Phillips. Mr. Learned, during his 25 years with the company, has served as chief engineer, superintendent of products pipe lines and in various other capacities.

H. O. HARDER, general superintendent of Sunray Oil Corporation's production department, has been elected vice president in charge of production to succeed James K. Ellis, resigned. Mr. Ellis is moving to San Antonio to become associated with the Slick-Urschel interests. He remains a member of the Sunray board of directors.

Mr. Harder has been associated with Sunray since 1945, when he joined the company as assistant general superintendent. He was named general superintendent of producing operations in the fall of 1947. Prior to 1945, Mr. Harder had worked in engineering and supervisory capacities for Cities Service Oil Co. and Indian Territory Illuminating Oil Co. throughout the mid-continent area. He was graduated from the University of Oklahoma in 1927.

JOHN BLACK director of publicity for Walter Weir Inc., advertising agents for The M. W. Kellogg Co., sailed for Europe on June 21. He will visit in England, Scotland and France. In England he expects to confer with public relations men there on closer coordination of this work in the two countries.

Moves Offices

Jefferson Chemical Co., Inc., has moved its executive and sales offices to new and larger quarters at 711 Fifth Avenue, New York 22, N. Y. Jefferson's plant at Port Neches, Texas, which was placed in production early in 1948, manufactures ethylene oxide, ethylene glycol, ethylene dichloride and other ethylene-based chemicals. Jefferson is owned by American Cyanamid Co. and The Texas Co.

JOHN H. SCHAEFER, Ethyl Corporation vice president in charge of manufacturing, was elected president of the Industrial Research Institute at the eleventh annual meeting in May. Mr. Schaefer, who was vice president of the Institute last year, has been associated with Ethyl Corporation for 23 years and has been a vice president of the company since 1943. He lives in Baton Rouge, La., where Ethyl's anti-knock manufacturing plant is located.

Struth Joins API

H. J. Struth of the Petroleum Engineer staff has been appointed assistant director of the department of information of the American Petroleum Institute, succeeding Robert E. Allen who resigned effective May 31. Mr. Struth will serve as administrative aide to Director H. B. Miller. Prior to the 2½ years that Mr. Struth spent with the Petroleum Engineer, he was with the Mid-Continent Oil and Gas Assn. as an economist and administrative aide for 10 years.

Field Service Facilities Merged

Service facilities in west Texas and New Mexico of Johnston Oil Field Service Corp., a Texas corporation with home offices in Houston, and of the M. O. Johnston Oil Field Service Corp., a California corporation, have been consolidated. Both corporations have heretofore been servicing oil field testing tools, gun perforation, pressure recorders, packers, adjustable flow beans and other oil field tools in west Texas. The move will eliminate the overlapping of services.

Teeters Joins Kellogg

Wilber Otis Teeters has joined The M. W. Kellogg Co. at the Jersey City laboratory of its petroleum and chemical research department. He is associated with product development activities in the petroleum and chemical fields.

Frank Adair Leovy

Frank Adair Leovy, formerly vice chairman of the board and a director of Gulf Oil Corp. and chairman of the board and a director of Gulf Refining Co., died at his home in Pittsburgh June 2. He had retired from his official positions with Gulf on April 30, 1946.

Mr. Leovy began his 42-year association with Gulf at Beaumont in 1904, holding many responsible positions in the production and pipeline departments of the Gulf companies in Texas and Oklahoma. In 1914 he was transferred to Gulf's executive offices in Pittsburgh, Pa., from where he directed the production and pipeline activities of the companies in the United States and abroad.

Davison Moves Baltimore Offices

The Davison Chemical Corp., Baltimore, Md., has moved its general offices to the newly renovated and airconditioned Davison Chemical Building—Charles and Fayette Streets, Baltimore 1. The postal address, however, continues as The Davison Chemical Corp., Baltimore 3. The Davison Chemical Building is a 12-story structure located in the heart of Baltimore's business district. Its total floor area is 50,000 square feet, of which Davison will occupy 25,000—the entire 7th, 8th, 9th, 10th, 11th and 12th floors.

Davison's manufacturing and research activities at Baltimore's Curtis Bay plant will, of course, remain at that location. Davison now operates 10 plants in strategic locations throughout the nation. The corporations' products include silica gel, silicofluorides, sulfuric and hydrofluosilicic acids, catalysts, fertilizers and fertilizer materials and asphalt compounds.

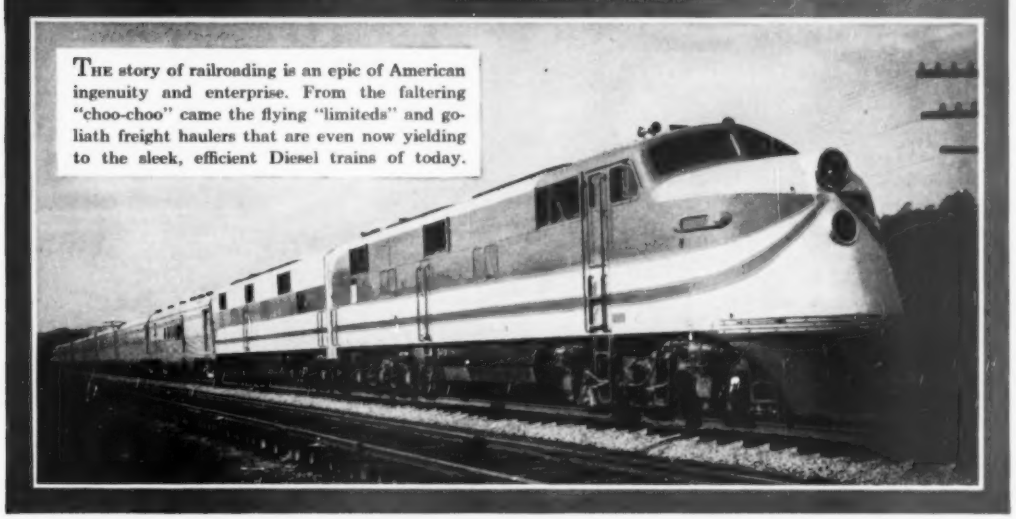
Modifies Dealer Contracts

Standard Oil of California is modifying its agreements with approximately 6,000 independent service station operators as a result of a decision of the United States Supreme Court invalidating dealer contracts calling for exclusive handling of Standard's products. T. S. Petersen, Standard president, said that the company does not anticipate a loss of dealers or of gross volume of business.

Visit California and Texas

The above picture taken by Tony Woracek of IDECO, New York, shows his guests on a recent tour in the Dresser Industries plane which carried them to California and Texas, where they visited various field operations and Dresser plants. In Louisiana they visited off-shore wells near Cameron. Left to right: Edward F. Carney, Asiatic Petroleum Co.; E. P. Bresenham, Socony-Vacuum Oil Co.; D. M. Engle, manager, Sinclair foreign operations; John H. Bowman, Creole Petroleum Corp.; Leo J. Van Dijk, Asiatic Petroleum Co.; D. E. Davis, Standard-Vacuum Oil Co.; E. D. Hopkins, The Texas Co. foreign department.

"Black Beauty" becomes the "Silver Streak"



THE story of railroading is an epic of American ingenuity and enterprise. From the faltering "choo-choo" came the flying "limiteds" and goliath freight haulers that are even now yielding to the sleek, efficient Diesel trains of today.

THROUGHOUT railroading history, lubrication has ever been a vital factor in smooth, continuous operation. Texaco engineers, working with the rest of industry, scored important victories against "hot boxes," driving journal and other steam locomotive lubrication problems . . . now are making important contributions to the greater operating efficiency of Diesel trains with their powerful engines and intricate control systems and equipment.

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TEXACO

ATTITUDE MORE HOPEFUL ON OIL FOR WAR

By Joseph Huttlinger

Washington

IN Washington the spotlight continues on the problem of oil for a possible war, with two new developments of importance.

In one, the National Military Establishment sees the need of a 15 percent boost in total Western Hemisphere capacity over a period to meet the needs of a five year war. In another, the military has transferred the Armed Services Petroleum Board, for seven years a semi-independent agency in the military set-up, to the Munitions Board. It is now the Petroleum Committee of the Munitions Board.

The 15 percent statement come from Secretary of Defense Louis Johnson in a letter to Ernest O. Thompson of the Texas Railroad Commission. Its object was to put to rest any idea that the United States has plenty of oil for war or peace.

Mr. Thompson has been trying to have the military tell how many barrels of oil it would need to fight a war. He argues that the military should tell how many airplanes, ships, tanks and men it would need.

In his letter, the Secretary maintained that we would have to rely on foreign oil in the event of war. To the extent this is necessary, he said, "there is a vital situation from a national defense standpoint with respect to petroleum."

Nearest to an answer, and perhaps the most specific public estimate recently by the military, is this paragraph in the Johnson letter:

"Currently, the Western Hemisphere picture is relatively sound. Nevertheless, the fact remains that if a major five year war were to start today, total Western Hemisphere production must be expanded by 15 percent by the end of the five year period.

"In that event, provided all the wartime production potential of the Western Hemisphere can be appropriately channeled into a joint war effort, by the United States, it then can be said that we are in a relatively sound position from a petroleum standpoint."

The Secretary expressed doubts that it all could be pumped into the war effort. He warned, further, that the North Atlantic Pact may mean additional petroleum demands in Europe. He repeated that the Middle East may be lost to us in the event of war.

He then referred to recent cutbacks in domestic production, and said this has a very good side, as well. The bright part, he said, is that "all that part of Texas cutbacks which is surplus is available for mobilization needs."

Further than this, the Secretary did not go on specific war needs. Detailed figures "are secret." Further, they are subject to changes with new weapons, vehicles, and economic factors.

In the light of this letter, a quick review of some recent statements on oil for war is timely. In January 1948 Secretary of Defense James Forrestal told the House Armed Services Committee that a war would call for 2,000,000 barrels a day more if we were to rely on United States supplies. The committee raised the figure to 3,000,000 in its report a few months later. Later, Under-Secretary W. John Kenney of the Navy told Congress that there had been a "major improvement" in petroleum supply. That was in a letter March 11, 1949, to the House Foreign Affairs Committee. He said there have been "current upward revisions of estimated petroleum availabilities" and there is "an improved wartime petroleum situation" over that to which Mr. Forrestal had referred.

Then came the Johnson letter. This hews to the line laid down by Mr. Kenney but is less reassuring. Some say it was put out to temper some of the optimism following the release of the Kenney letter. Requests to military officials to clarify the situation further bring the comment that both letters are accurate but that perhaps they are based on slightly different assumptions. As for the assumptions, they are secret, say military officials.

The shift of the petroleum board with a staff of about 50 to the Munitions Board may preserve the semi-independent status and powers of the agency, and officials of the board and the oil industry hope this will be so. There is some doubt, however. The directive of transfer said the board is to be transferred "intact as an organization . . . including its present personnel, property, equipment and records." The directive also said that the staff of the petroleum committee "shall not be duplicated" by other agencies of the military. The duties of the board continue to be interservice planning and making recommendations "as may be requested by any agency of the National Military Establishment." The earlier setup had been for the Armed Services Petroleum Board to advise specifically "the Joint Chiefs of Staff, the Munitions Board and the Research and Development Board."

The big fear of the petroleum staff personnel is that the Munitions Board, technically the parent agency of the petroleum committee, may try to take control of the committee. This, say the staffers, would be bad. Oil, called "the most vital logistics problem" and accounting for a tremendous volume of wartime shipments, needs an agency all its own.

Inasmuch as the 12 key duties of the petroleum board, now the petroleum committee, are little known, a list of them as announced by Mr. Johnson may prove interesting:

(1) Prepare for the Munitions Board plans of governing the military aspects of industrial mobilization of petroleum for a future emergency.

(2) Prepare for the Joint Chiefs of Staff or the Munitions Board evaluations of the petroleum feasibility of strategic or logistic plans based upon current estimates of potential production, procurement and transportation capabilities maintained by the Armed Services Petroleum Board.

(3) Analyze and review for the appropriate authorities, as directed, both current and mobilization programs for military requirements for petroleum as submitted by the services.

(4) Coordinate the Munitions Board policies and program for the use of or disposal by the military departments of petroleum plants and facilities and on the maintenance of an adequate industrial reserve of petroleum facilities.

(5) Conduct studies on those phases of industrial security concerned with petroleum facilities.

(6) Advise the Munitions Board with respect to foreign trade and related matters.

(7) Prepare estimates of petroleum capabilities for war involving foreign nations.

(8) Furnish Military Establishment representation on inter-departmental committees on petroleum, and represent the Military in its relations with the Military Petroleum Advisory Board.

(9) Advise the Munitions Board on coordination of specifications and standardization.

(10) Prepare such studies and perform such duties and functions in connection with petroleum matters as may be requested by the Secretary of Defense, the Joint Chiefs of Staff, the Munitions Board, the Research and Development Board and the Secretaries of the Army, Navy and Air Force.

(11) Advise the Joint Chiefs of Staff, the Munitions Board, the Research and Development Board, and the Armed Services Petroleum Purchasing Agency and the Secretaries of the Army, Navy and Air Force on petroleum policy matters, including recommendations on oil legislation.

(12) Exercise general direction, authority and control over the Armed Services Petroleum Purchasing Agency.

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New Additive

An all-chemical additive for crankcase lubricants has been announced by American Cyanamid Co. This new product, which is designated Aerolube 70, is the result of several years development work. The company states that the new additive is an excellent oxidation and bearing corrosion inhibitor which permits close manufacturing control of the finished motor oil. It is light in color, has a pleasant odor and is characterized by complete solubility in oil, stability and compatibility with other additives. In using the new additive it is not necessary to purchase diluent oil.

Opens New Houston Offices

Dresser Industries, Inc., celebrated the official opening of new division offices and service depot at 1619 Ovid Street, Houston, Texas, with an open house party early in May. The party was attended by more than 600 guests in the oil and gas industry and a number of Dresser officials. The plant contains 6,000 square feet of air-conditioned office space and 14,000 square feet of warehouse facilities.

Under the supervision of Fred H. Hayes, division manager at Houston, Clark Bros. Co., Inc., will maintain a complete service and parts department staffed by service engineers. International Derrick & Equipment Company will use the new Dresser headquarters for office facilities in this area. Louis R. Spencer will serve as district manager of the Ideco stores division, and R. A. Feemster, technical representative, who will be in charge of the Gulf Coast area for the machinery and export division of Ideco. Security Engineering Company's service will be under the direction of John W. Stewart, Gulf Coast manager. Wendell R. Carlson is Houston division manager for the centrifugal pump division of Pacific Pumps. Pacific oil well plunger pumps are distributed and serviced by the Republic Supply Company in this area. District manager, G. B. Buchner of Kobe, Inc., stated that his firm will maintain district headquarters for the entire Gulf Coast area, from New Orleans, La., to Brownsville, Texas, at the new plant.

Dresser Manufacturing Division, Bradford, Pa., will continue to occupy its southwest office at 1121 Rothwell Street, Houston. This office is in charge of Elton E. Peavy.

Folder on Unit Fabrication

Crane Co., 836 South Michigan Av., Chicago, offers a folder on the advantages and economies of factory unit-fabrication of welded piping headers, assemblies and valve groupings into one-piece, pretested units. Plant facilities are discussed; sample unit-fabrications are shown and analyzed.

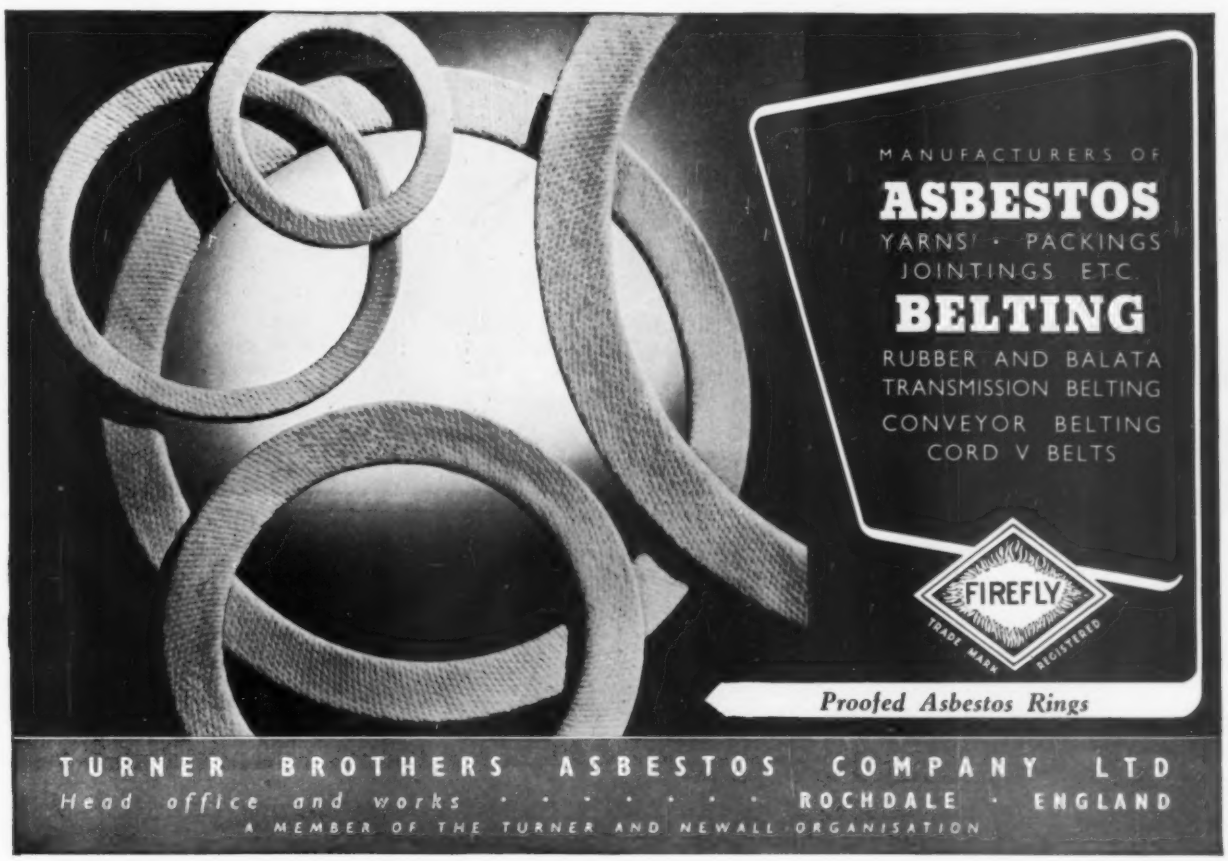
World-Wide Demand for Equipment

All the countries of the world are in the market for oil equipment, J. E. Brantly, president of Drilling and Exploration Co. told the Los Angeles Nomads at their June meeting. The statement was part of Mr. Brantly's appraisal of world markets following extensive trips to Europe and South America.

Mr. Brantly pointed out that the need for new equipment holds in spite of the fact that more oil is now being produced than the world can use. The trouble is that countries that could use more oil do not have the goods or dollars to buy the oil they need. The result is that each nation is trying to increase production and take care of their petroleum requirements by developing their own resources. This means drilling campaigns and increased construction on a world-wide scale.

As an example of present market conditions, Mr. Brantly pointed to Argentina and Brazil. These countries, he said, each use about 60,000 barrels of oil a day. Argentina could use 300,000 and Brazil 500,000 barrels a day. But they do not have money or products to buy the difference. Both countries are now actively engaged in trying to make up this difference within their own borders. Our own crude oil supply is not inexhaustible, Mr. Brantly stated, and oil from the Middle East, from Venezuela and Mexico is and will be of great importance to our country.

Speakers and officers of Nomads at June meeting: R. J. Eicho & Associates, chairman, national board of regents; J. E. Brantly, president, Drilling & Exploration Co.; John Hurndale, Edwin W. Pauley; Lee J. Laird, president, Los Angeles chapter; Fred C. Ripley, secretary-treasurer, national board of regents.



T. J. Sullivan

Willard F. Jones

W. A. Berryman

AT THE MAY MEETING of the board of Gulf Oil Corporation W. A. Berryman, Willard F. Jones and Thomas J. Sullivan were elected vice presidents. At the same time the appointment of Bonnar H. Barnes as general manager of refineries was announced.

Mr. Berryman, newly-elected vice president and assistant general manager of foreign marketing, joined Gulf in 1933 and immediately was sent to Belgium, where he remained until 1939 when he returned to Pittsburgh and was appointed assistant to the vice president in charge of foreign marketing.

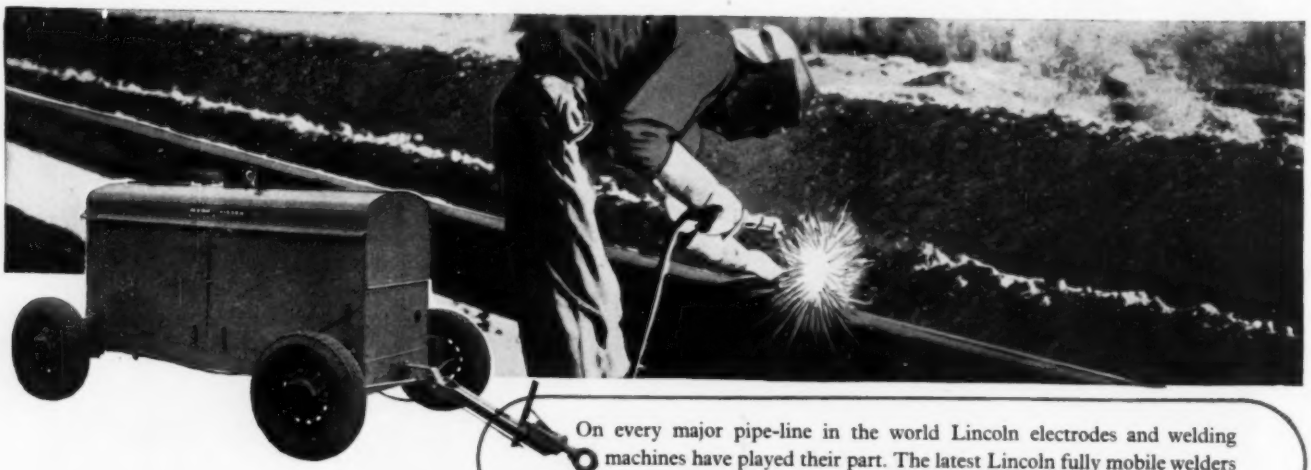
Mr. Jones, the new vice president in charge of marine operations, has been an employee of the Gulf marine department for 46 years. He served in various capacities from 1903 until 1913, when he was appointed purchasing agent for the marine department. During World War I he was promoted to assistant marine superintendent, and in 1929 he was named superintendent. Mr. Jones' elevation to general manager of Gulf's marine department took place in 1936. During his entire career, Mr. Jones has been extremely active in shipping circles, having been a member of the advisory committee of Lloyds of America, and currently is a member of the board of managers of the American Bureau of Shipping and a member of the Society of Naval architects and Marine Engineers.

Mr. Sullivan, vice president in charge of manufacturing, began his term of Gulf service in 1921 at the company's Port Arthur, Texas, refinery. In 1935 he was appointed general superintendent of Texas refineries, and in 1939 he went to Pittsburgh as assistant general manager of the manufacturing department, a year later becoming general manager.

Mr. Barnes's connection with Gulf dates back to 1921 when he was employed as a chemist. Between 1929 and 1945 he served as superintendent of various Gulf refineries. In the latter year he was transferred to the general offices in Pittsburgh as assistant general manager of the manufacturing department.

Messrs. Berryman, Sullivan and Barnes will continue to be located in Pittsburgh, while Mr. Jones will continue his headquarters in New York.

Welding the World's Pipelines..



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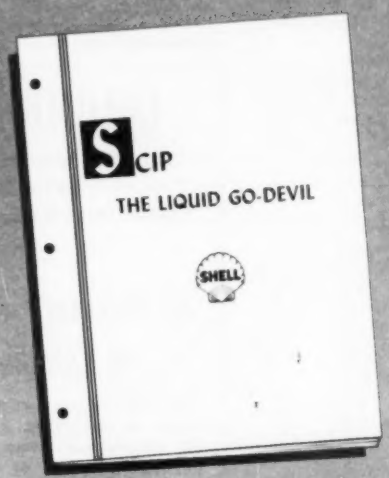

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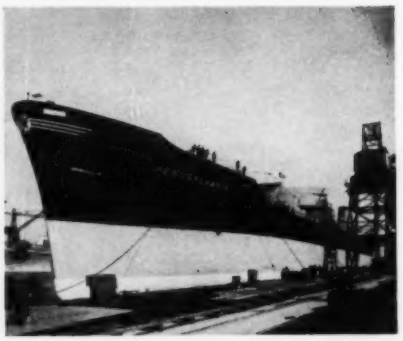

Super-Tanker "Pennsylvania" Launched

The Texas Company's 16-knot super-tanker "Pennsylvania" recently was launched at the Quincy, Mass., yards of Bethlehem Shipbuilding Corp., 225 days after the keel was laid. The "Pennsylvania" has a deadweight tonnage of 28,000 tons, a liquid cargo capacity of 240,000 barrels and 65,600 cubic feet of space for dry cargo. Steam for the turbines has a temperature at boiler outlet of 840°F and a pressure of 600 psi. Normal horsepower is 12,500 at 100 propeller rpm and a maximum of 13,750 hp at 103 rpm. The low pressure turbine operates at 2,630 rpm and the high-pressure turbine at 4,700 rpm.

Overall length of the "Pennsylvania" is 624 feet, 7½ inches, and length between perpendiculars 595 feet. Breadth, moulded, is 84 feet and depth 44 feet. Loaded draft is 33 feet.

Hufnagel Joins Koch

John "Jack" Hufnagel has been appointed manager of the Kaskade tray division of the Koch Engineering Co., Wichita, Kansas. Mr. Hufnagel was formerly with Hydrocarbon Research, New York City. Perry Kilsby, Inc., 3311 East Slauson, Los Angeles, Calif., has also been appointed Pacific Coast representative for Koch Kaskade fractionating trays.

1949 Oil Directory

The Petroleum Register, 27th edition, 600 pages, $15 postpaid, published by The Petroleum Register, 318 South Central Ave., Los Angeles 13, Calif. New edition published May 15 contains more than 40,000 individual listings of oil and allied companies and individuals in 130 countries throughout the world. A standard guide to the oil industry for more than a quarter of a century.

To Represent Reed in Northern Alberta

New senior representative for Reed Roller Bit in northern Alberta is Paul Steele, a former Reed representative in the Rocky Mountain area. Mr. Steele has had extensive experience in the selling field. His career began in Oklahoma City in 1929 when he became a wire rope salesman. Later he became a sales representative for Reed in the Rocky Mountain district, including Rangely, and more recently, Farmington, New Mexico.

Tapline Agreement Signed

Final bar to early completion of Trans-Arabian Pipe Line Company's 1,067-mile oil line across Arabia to the Mediterranean Sea has now been removed. A decree permitting laying of the line across Syrian territory to Lebanon has been signed by the government and representatives of Tapline. The decree requires ratification by the cabinet, but no difficulty is anticipated in obtaining this.

As a result of the Syrian agreement Tapline officials plan to begin early work on the western end of the line. The eastern end is being laid now at the rate of about one mile daily. This will be stepped up to about one and one-half miles daily. Recent release of steel by the Department of Commerce and easing of the steel supply situation suggest that the line can now be completed by the end of 1950.

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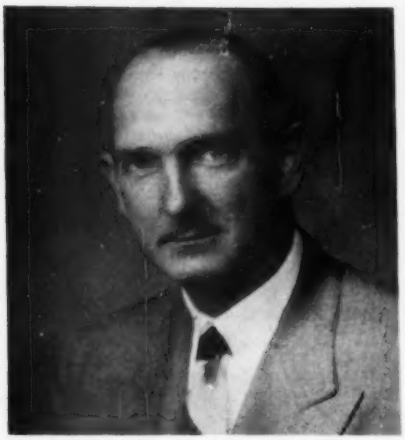


John C. Kjerner

JOHN C. KJERNER has been appointed manager of the eastern sales of Warren Petroleum Corporation's liquefied petroleum gas division with headquarters at Newark, N. J. He succeeds C. L. Hulswitt. Mr. Kjerner jointed the Warren organization recently after four years of sales and plant installation experience with American Gas Conversion's, Inc., with which he became affiliated following his discharge as a U. S. Marine Corps flier after 3½ years of service in World War II.

Sinclair Opens New Type Stations

Five gleaming porcelain enamel service stations were opened to the public by Sinclair Refining Company in Houston, Texas, last month. They were the first of 17 to be built in that city and of a large number to be added throughout the south. The opening was a gala occasion with speeches by the Mayor and company officials, circus acts, music and other entertainment. A feature was the release of hundreds of balloons, each carrying a certificate entitling the finder to free merchandise. The stations themselves are models of up-to-date construction and include many novel features for the comfort and convenience of motorists.

API Revises "Petroleum"

The third edition of "Petroleum, The Story of an American Industry," first published by the American Petroleum Institute in 1930, has been completely rewritten and expanded. Well illustrated with maps, charts and drawings, the new book portrays the history of petroleum from its beginnings hundreds of millions of years ago, its "birth" as an industry in Titusville, Pa., in 1859, and its widespread use and benefits in this contemporary period. Special chapters are devoted to discovery and production, refining, transportation, marketing and conservation, the key branches of the industry.

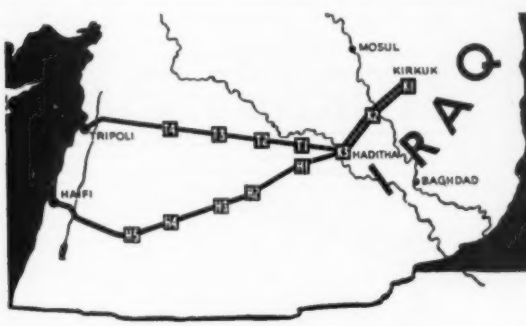
Written in easily understood language, the book makes an excellent reference manual for libraries and schools and for the laymen who would like to have a better working knowledge of this great American industry.

It is an interesting book too for the thousands of persons employed in both the oil and gas industries. The book was published by the Institute to help provide the public with a better understanding of this industry which has served them so well during 90 years of history. Single copies of the books are priced at $1, with substantial discounts on quantity orders, and may be obtained from J. A. McNally, American Petroleum Institute, 50 West 50th Street, New York, 20, N. Y.

Heads Oil and Gas Department

Chemical plants division of Blaw-Knox Co. has appointed Arne Olson as chief process engineer and R. H. Hazlett as manager of the oil and gas department. Mr. Olson has been chief engineer of process equipment at a Blaw-Knox plant. The promotion of Mr. Hazlett entrusts him with two responsibilities, for he is also serving as manager of gas equipment at one of the company's manufacturing plants. He was named manager of the gas equipment department in 1946.

R. H. Hazlett



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Fluor Appoints McKay

The Fluor Corp., Ltd., has appointed Jack E. McKay as manager of advertising and public relations. Mr. McKay assumed this new position following three years as assistant to J. P. Wiseman, vice president and director of sales for Fluor. Prior to joining Fluor in 1942 Mr. McKay was associated with The Carter Oil Co. in Tulsa and the Sinclair Refining Co. in Sand Springs, Okla.

Leases New Offices

Maritime Petroleum Corp. has leased the entire 24th floor penthouse at 488 Madison Avenue, now being erected in New York City. The new headquarters will be occupied early in 1950.

New Petroleum Register

The 27th edition of The Petroleum Register, just off the press, contains 40,000 individual listings, an increase of more than 5,000 from the 26th edition. The 600-page volume lists companies and individuals operating in all branches of the industry, producing, refining, marketing, natural gasoline, LP gas, grease and oil compounding, carbon black, asphalt and road oil, drilling and transportation. Government bureaus and oil associations are listed. Cost of the volume is $15 postpaid. Address orders to THE PETROLEUM REGISTER, 318 South Central Ave., Los Angeles 13, Calif.

Survey of De Mares Properties

Following the official decision of the Colombian government to take over the DeMares properties including the Tropical refinery at Merranca Bermejo in the Magdalena Valley at the end of the concessionary period in 1951, surveys are being made to determine the course to be followed in further development of the area. Engineers Henry N. La Croix, Phillip Verity and Edward F. Reich of the Foster Wheeler Corp., New York, have been making an inspection of the refinery, and representatives of Western Geophysical Company, of Los Angeles, are shortly to make a survey of the undeveloped portion of the region. Other studies will deal with transportation and marketing conditions. At the conclusion of these investigations, a full report will be made by the Foster Wheeler representatives and a committee of the National Petroleum Council.

As matters stand now the Congress has approved the taking over of the oil property by the government, and the suggestion has been advanced that it might be operated by a mixed company representing both the state and private capital.

Harcus Appointed General Manager

E. S. Dulin, president of Byron Jackson Co., has announced the appointment of Robert Harcus as general manager of International Cementers, Inc. Mr. Harcus, who succeeds John Chesnut, has been with Byron Jackson Co. since 1945, and active in the development and application of shaped charges in the oil industry. Before joining Byron Jackson Co., he was in Burma and India for 23 years with The Burmah Oil Co. Ltd. as field superintendent and manager of prospecting operations.

Frank D. Smith, formerly California division manager, was appointed assistant general manager. Robert D. Fagan succeeds him as California division sales manager. Jack Smith is manager of foreign sales.

Robert Harcus

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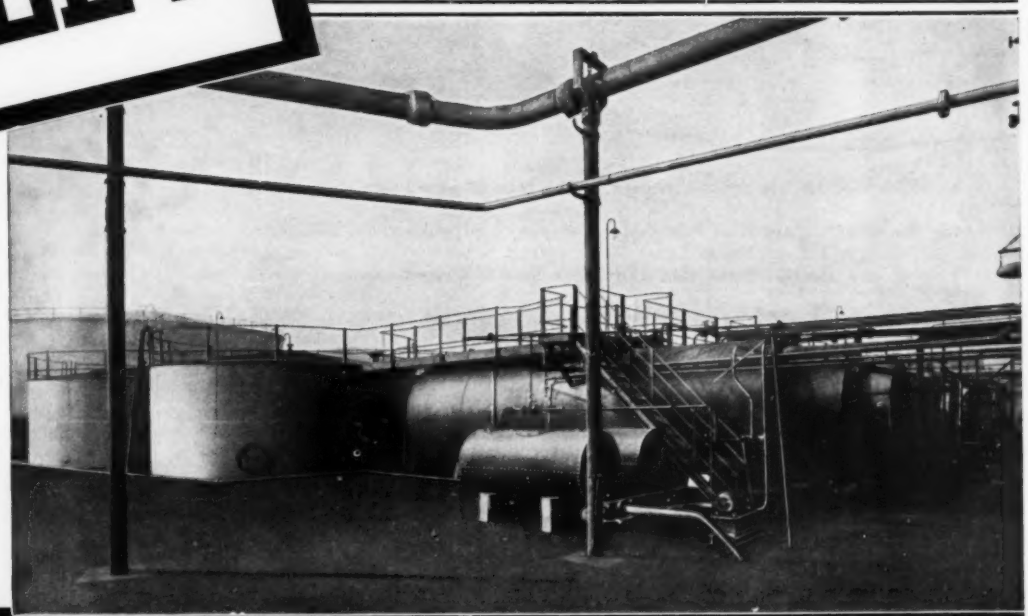

Part of a battery of ten, electrically-welded steel storage tanks 9'0" dia. x 30'0" long with tank in background 25'0" dia. x 10'0" deep. Erected at Ellesmere Port, Cheshire. (Photograph by courtesy of Lobitos Oilfields Ltd.)

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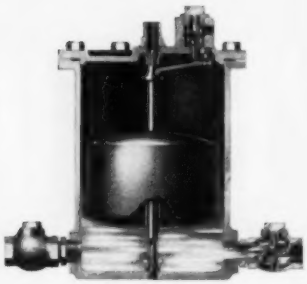

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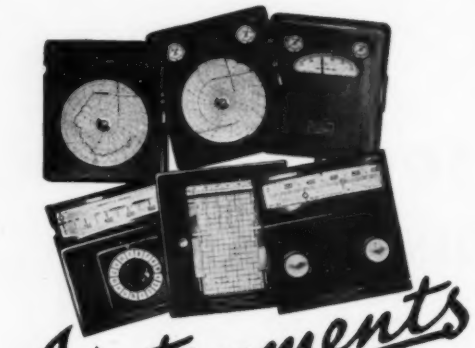

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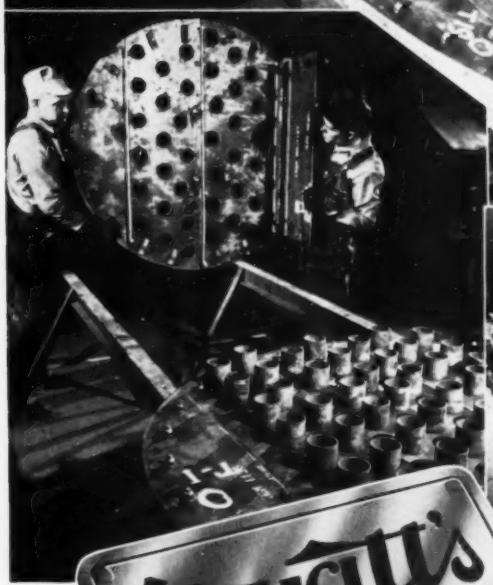

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